Final Staff Assessment (Part 3)

THREE MOUNTAIN POWER PROJECT

Application For Certification 99-AFC-2
Shasta County, California

CALIFORNIA ENERGY COMMISSION

STAFF REPORT

NOVEMBER 2000
(99-AFC-2)

Gray Davis, *Governor*

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THREE MOUNTAIN POWER PROJECT
EXECUTIVE SUMMARY

INTRODUCTION

This Final Staff Assessment (FSA) Part 3 contains the California Energy Commission (Energy Commission) staff's evaluation of the Three Mountain Power, LLC's (the applicant) Application for Certification (AFC) (99-AFC-2) for the Three Mountain Power Project (TMPP). The topic areas addressed in Part 3 include Biological Resources, Soil & Water Resources and Alternatives. Other issues were addressed in Part 1 of the FSA, published on January 24, 2000, and Part 2 published on November 3, 2000.

The TMPP electric generating plant and related facilities, such as the electric transmission line, natural gas pipeline and water lines, are under the Energy Commission's jurisdiction and cannot be constructed or operated without the Energy Commission's certification.

Staff is an independent party in the proceedings. This FSA contains staff's independent analysis of engineering and environmental aspects of the TMPP, based on the information available at that time of document creation. These analyses are similar to those contained in an Environmental Impact Report required by the California Environmental Quality Act (CEQA). It is important to note that the FSA is not a Committee document nor is it a final or proposed decision on the proposal. The FSA presents staff's testimony and contains conclusions and proposed conditions that staff recommends apply to the design, construction, operation, and closure of the proposed facility, if certified.

BACKGROUND

On March 3, 1999, the applicant filed an AFC with the Energy Commission to construct and operate the TMPP. On April 14, 1999, the Energy Commission determined that the application should not be accepted due to data inadequacies. On June 4, 1999, the applicant filed supplemental information to address the list of data inadequacies adopted by the Energy Commission. The Energy Commission deemed the application complete at its June 23, 1999 business meeting. The analyses contained in this FSA are based upon information from: 1) the AFC; 2) subsequent amendments; 3) responses to data requests; 4) supplementary information from local and state agencies and interested individuals; 5) existing documents and publications; and 6) independent field studies and research.

PROJECT DESCRIPTION

The TMPP will be located in northeastern Shasta County, approximately one mile northeast of Burney, California, and 45 miles east of Redding, California. The site is located on a 40-acre site that is zoned for industrial use. Approximately one-third of the site is currently developed and used by Burney Mountain Power, LLC, which operates a 10 megawatt (MW) biomass-fueled power plant. The site is located on State Route 299, northeast of Black Ranch Road between the towns of Burney and Johnson Park, (Township 35 North, Range 3 East, on Assessor's Parcel Number 030-390-36). See **PROJECT DESCRIPTION** Figures 1 and 2 for the location of the project.

The 500 MW nominal rated combined cycle design will consist of two "F" class combustion turbines (170 MW each), two heat recovery steam generators (HRSG) and one steam turbine (up to 230 MW). The applicant is currently considering two manufacturers for the "F" class combustion turbines: General Electric and Westinghouse. The combined cycle configuration will incorporate water treatment equipment, air compressor, inlet air evaporative coolers, turbine and generator set, continuous emission monitors, control room and administrative building, step-transformers, heat recovery steam generators, a steam turbine, two 140 foot exhaust stacks, a hybrid cooling system (consisting of both wet and dry cooling towers), selective catalytic reduction (SCR) and aqueous ammonia storage and handling equipment. The SCR and ammonia are used to reduce nitrogen oxide (NOx) emissions. The SCR and dry low NOx combustion technology will reduce NOx emissions from the combined cycle configurations to 2.5 ppmvd, or less, at 15 percent oxygen. The heat recovery steam generators are used to recover waste heat from the combustion turbine exhaust to produce steam. This steam is then expanded in the steam turbine to produce electricity. The project is expected to have an overall availability of 95 percent and to operate up to 8,760 hours per year.

The project consists of a power island, administrative buildings, chemical storage areas, cooling tower and other support facilities. Natural gas will be supplied to the project via a new 12-inch pipeline connection with Pacific Gas and Electric Company's (PG&E) natural gas pipeline located southeast of the project site. The applicant has identified three alternative routes for the natural gas pipeline connection. The applicant's September 2, 1999 response to staff's data request 16 indicated that route A will be used. This route calls for a 2,900 foot connection.

The cooling water utilized by TMPP will come from three sources: a) fresh groundwater will be pumped by the Burney Water District (BWD) from two new wells; b) displaced water use from Burney Mountain Power (BMP), which will be achieved by retrofitting the BMP facility with a hybrid cooling system and/or reducing operating of the BMP facility; and c) if contractual agreements can be reached with the BWD, treated wastewater will be provided by BWD from the wastewater treatment adjacent to the proposed project site.

The applicant will use no more than 600 acre-feet per year of groundwater that historically has not been used for power plant cooling. This is groundwater that will be pumped by BWD from two new wells. The Burney Water District will construct approximately 3,000 feet of new 14-inch inch pipeline to connect new wells to the Burney Water District storage tank and construct a new 4,700 foot 24-inch pipeline from the new wells to the project site. The applicant can increase its use of groundwater beyond the 600 acre-feet per year of new water, by up to 350 acre-feet per year, by using groundwater that the BMP Facility historically has used for cooling water purposes. This is due to the fact that historically BMP has used approximately 350 acre-feet of groundwater per year from a BMP well located adjacent to the BMP Facility. Pursuant to the Detailed Mitigation Plan[1], the 350 acre-feet currently used by BMP will now be shared between BMP and TMPP. The BMP facility will be retrofitted with a hybrid cooling water system or BMP will reduce its operations or both to reduce its water use.

As part of the Detailed Mitigation Plan, the applicant has agreed to enter into negotiations with BWD to: a) upgrade BWD's Wastewater Treatment Plant ("WWTP") to meet California Department of Health Services (DHS) standards for Disinfected Tertiary Recycled Water, b) obtain DHS and other regulatory approvals for the upgrade, and c) provide any wastewater produced by the upgraded WWTP ("Reclaimed Water") to TMPP for cooling purposes**. If these negotiations are successful**, the applicant intends to use the Reclaimed Water for cooling the TMPP.

A new PG&E switchyard will be located on the project site. The line connecting the TMPP facility to PG&E's switchyard will be a 230 kV single circuit transmission line. The tie-in with the existing PG&E 230 kV Pit River hydro transmission line is approximately 800 feet west and then 1800 feet in a northerly direction adjacent to the McCloud River Railroad easement. The Pit #1-Pit #3 230 kV transmission circuit and the Pit #1-Cottonwood 230 kV transmission circuit will be intersected and looped to the new PG&E switchyard. To accommodate the TMPP power output, 60 lineal miles of reconductoring[2] utilizing existing towers to the Round Mountain and Cottonwood substations is proposed. These transmission lines are shown on **PROJECT DESCRIPTION** Figure 1.

The project is estimated to have a capital cost of about $250 million. The applicant plans to complete construction and start operation of the TMPP by the second quarter of 2002. During construction, an average of approximately 200 workers would be employed. During operation, the TMPP would employ 20 to 25 full-time staff.

STAFF'S ASSESSMENT

Each technical area section of the FSA contains a discussion of impacts, mitigation measures and conditions of certification. The FSA includes staff's assessments of:

- the environmental setting of the proposal;
- impacts on public health and safety, and measures proposed to mitigate these impacts;
- environmental impacts, and measures proposed to mitigate these impacts;

[1] "Detailed Mitigation Plan and Analysis of Impact Assessments In Resource Areas Affected by the Mitigation Plan", August 21, 2000.

[2] "Reconductoring" consists of removing the old insulators, installing new insulators and replacing the old conductors with new conductors with a higher capacity.

- the engineering design of the proposed facility, and engineering measures proposed to ensure the project can be constructed and operated safely and reliably;
- project closure;
- project alternatives;
- compliance of the project with all applicable laws, ordinances, regulations and standards (LORS) during construction and operation; and
- proposed conditions of certification.

ANALYSES

Staff's FSA Part 1 published on January 24, 2000 consisted of the following 19 technical areas:

Need Conformance	Socioeconomics
Public Health	Waste Management
Hazardous Materials Handling	Geology and Paleontology
Transmission Line Safety & Nuisance	Facility Design
Land Use	Reliability
Traffic and Transportation	Efficiency
Noise	Transmission System Engineering
Visual Resources	General Conditions/Compliance
Cultural Resources	Worker Safety and Fire Protection
Biological Resources	

Hearings were conducted on all of these topics except Biological Resources, Noise, and Public Health. On August 21, 2000, the applicant filed its "Detailed Mitigation Plan and Analysis of Impact Assessments In Resource Areas Affected by the Mitigation Plan" (Detailed Mitigation Plan). The Detailed Mitigation Plan affects staff's analysis in a number of topic areas, which will require that the record for some topic areas will need to be reopened, and for other areas, staff will need to revise its analysis to reflect these changes. Those areas are:

Topic Areas for Which the Evidentiary Record will Need to be Reopened	Topic Areas not yet heard, that will Require New or Additional Analysis
Project Description[3]	Air Quality
Land Use	Public Health[3]
Visual Resources	Biological Resources[3]
Waste Management	Soils & Water Resources
Power Plant Efficiency	Noise[3]

[3] Staff's testimony on the project description, public health, noise and biological resources was contained the FSA Part 1. Staff has revised its testimony for these topics to reflect the Detailed Mitigation Plan. The testimonies in these areas from the January 2000 FSA Part 1 should be replace in total with the testimonies in FSA Parts 2 and 3.

FSA Part 2 contained staff analysis of the proposed project (including staff review of the Detailed Mitigation Plan) for all of the above topic areas except Biological Resources, Soil & Water Resources and Alternatives, which are contained this FSA Part 3. Staff also examined the potential environmental consequences of construction and operation of the wastewater treatment facilities to be install and operated by BMW. Staff found that this project would not result in any significant environmental impacts.

STAFF RECOMMENDATION

If the mitigation measures and conditions of certification recommended by staff are implemented, staff believes that the project will have an insignificant impact on soil & water resources and biological resources and will comply with applicable regulations governing soil & water resources and biological resources.

THREE MOUNTAIN POWER PROJECT (99-AFC-2)
FINAL STAFF ASSESSMENT PART 3

ALTERNATIVES

Testimony of Gary D. Walker

PURPOSE OF THE ALTERNATIVES ANALYSIS

The purpose of staff's alternatives analysis is to provide the Energy Commission with an analysis of a reasonable range of alternatives to the Three Mountain Power Project (TMPP) that could avoid or substantially lessen any potentially significant adverse impacts of the proposed project.[1] This analysis identifies the potential significant environmental impacts of the proposed project, and discusses technology and site alternatives and their ability to reduce or avoid potential significant impacts of the proposed project.

LEGAL GUIDANCE FOR ALTERNATIVES ANALYSIS

The "Guidelines for Implementation of the California Environmental Quality Act" (CEQA)[2] provide direction by requiring an evaluation of the comparative merits of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the project objectives." In addition, the analysis must address the "no project" alternative.[3]

The range of alternatives is governed by the "rule of reason" which requires consideration only of those alternatives necessary to permit informed decision-making and public participation. CEQA states that an environmental document does not have to consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative.[4] However, if the range of alternatives is defined too narrowly, the analysis may be inadequate.[5]

ALTERNATIVES ANALYSIS METHODOLOGY

To prepare this alternatives analysis, the staff used the methodology summarized below:

1. Describe the project objectives.
2. Identify any potential significant environmental impacts of the project.
3. Evaluate the environmental impacts of not constructing the project to determine whether the "no project" alternative is superior to the project as proposed.
4. Evaluate alternative technologies.

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1 Cal. Code Regs., tit. 14, Sec.15126.6(a); Cal. Code Regs., tit. 20, Sec.1765.
2 Cal. Code Regs., tit. 14, Sec.15000 et seq.,
3 Cal. Code Regs., tit. 14, Sec.15126.6(e).
4 Cal. Code Regs., tit. 14, Sec.15126.6(f)(3).
5 *City of Santee v. County of San Diego* (4th Dist. 1989) 214 Cal.App. 3d 1438.

5. Determine which, if any, of the potential significant environmental impacts could potentially be avoided by use of an alternative site.
6. Develop screening criteria for feasibility of alternative sites.
7. Select a reasonable range of alternative sites that:
    a. Meet most of the basic objectives of the project;
    b. Avoid or substantially lessen one or more of the potential significant effects of the project; and
    c. Satisfy the feasibility screening criteria.
8. If any alternative sites are deemed infeasible, explain why.
9. Evaluate the environmental impacts of each feasible alternative site.

POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS

In the Preliminary Staff Assessment (PSA) staff stated that potentially significant impacts might occur regarding air quality, water resources, biological resources, and cultural resources. Since then, based on additional information and assuming satisfactory implementation of proposed mitigation measures, staff has concluded that the potential environmental impacts of the project would be less than significant (see the air quality, water resources, biological resources, and cultural resources sections of the Final Staff Assessment (FSA)). Therefore, staff did not conduct detailed environmental evaluation of alternatives. However, this alternatives section of the FSA summarizes the additional information that staff gathered and evaluated regarding alternative sites after the PSA was published.

IDENTIFICATION AND SCREENING OF POTENTIAL ALTERNATIVES

ALTERNATIVES IDENTIFIED AND CONSIDERED

Staff identified and considered a broad range of potential alternatives to the proposed project. The alternatives identified and considered were:

- Alternative Sites
- Technology Alternatives
- Demand Side Management
- Distributed Generation
- Renewable Resources
- Solar
- Wind
- Biomass
- Hydropower
- Geothermal

- Identification and evaluation of Alternative Sites

ALTERNATIVE SITE IDENTIFICATION CRITERIA

Staff considered the following five criteria in identifying alternative sites.

1. Site suitability. Approximately 13 acres are required for the site. The shape of the site also affects its usability.
2. Availability of infrastructure. The site should be within a reasonable distance of the electric transmission system, natural gas supply, and water supply.
3. Availability of the site.
4. General Plan and zoning consistency.
5. Not located adjacent to moderate or high density residential areas or to sensitive receptors (such as schools and hospitals) or to recreation areas.

ALTERNATIVE SITES

Staff identified alternative sites through independent investigations. Staff contacted local governments and commercial/industrial real estate brokers and made field visits. Staff also reviewed the information in the AFC regarding the two alternative sites (B and C) that the applicant considered (TMPP 1999a, pp.5-3 through 5-8). Staff agrees with the applicant that use of either of the alternative sites identified in the application has more potential to cause significant environmental impacts than the proposed site. Therefore, staff did not conduct a detailed evaluation of those sites. To date, no public comments or suggestions have been received regarding any other alternative sites.

Staff identified ten sites in four geographical areas that meet most project objectives relevant to an alternative site analysis and satisfy staff's site identification criteria (see **ALTERNATIVES Figure 1**). **ALTERNATIVES Table 1** identifies the name, location, acreage, and parcel number of each site.

SITES ALT-1, ALT-2, AND ALT-3

Sites Alt-1, Alt-2, and Alt-3 are in Shasta County, south of the City of Anderson (see **ALTERNATIVES Figure 2**). All three of the sites have "M" (industrial) general plan designation and zoning. All of the sites are vacant.

SITES ALT-4 AND ALT-5

Sites Alt-4 and Alt-5 are in Glenn County, west of the City of Willows (see **ALTERNATIVES Figure 3**). Both sites have "M" (industrial) general plan designation and zoning. Both sites are in cultivated agricultural use.

SITES ALT-6 AND ALT-7

Sites Alt-6 and Alt-7 are in Colusa County, south of the community of Maxwell (see **ALTERNATIVES Figure 4**). Both sites have "M" (industrial) general plan designation and zoning. Both sites are currently used for irrigated agriculture.

Insert Alternatives Figure 1 Here

Insert Alternatives Figure 2 Here

Insert Alternatives Figure 3 Here

Insert Alternatives Figure 4 Here

Site Alt-8

Site Alt-8 is in the City of Williams (see **ALTERNATIVES Figure 5**). The site is designated “I” (Industrial). It is currently used for irrigated agriculture.

ALTERNATIVES Table 1
Alternative Site Characteristics

SITE	LOCATION	JURISDICTION	ACREAGE	PARCEL NO.
Alt-1	South of Anderson	Shasta County	34.3	201-70-10
Alt-2	South of Anderson	Shasta County	34.7	090-22-02
Alt-3	South of Anderson	Shasta County	12.5	90-34-8 and 90-34-9
Alt-4	West of Willows	Glenn County	14	Part of 17-22-17
Alt-5	West of Willows	Glenn County	14	Part of 17-22-18
Alt-6	South of Maxwell	Colusa County	14	Part of 14-11-40
Alt-7	South of Maxwell	Colusa County	14	Part of 14-11-47
Alt-8	Williams	City of Williams	13.54	Lot 22 in Valley Ranch Business Park
Alt-9	East of Fairfield	Solano County	31.89	Lot E in Lambie Industrial Park
Alt-10	East of Fairfield	Solano County	14	Part of Lot G in Lambie Industrial Park

Sites Alt-9 and Alt-10

Sites Alt-9 and Alt-10 are in Solano County, southeast of the City of Fairfield. The sites are in the south of the community of Maxwell (see **ALTERNATIVES Figure 6**). Both sites are in the Lambie Industrial Park. The sites are zoned “GM3” (Heavy Industrial). Site Alt-9 has been used as a pasture and has a barn on it. Site Alt-10 is vacant.

Comparison of Alternative Sites to Screening Criteria

Site suitability

All of the sites are of sufficient size and appropriate shape to accommodate the project.

Insert Alternatives Figure 5 Here

Availability of Infrastructure

Electric and gas lines are available for all ten of staff's alternative sites. Appendix A presents staff's assessment of the feasibility of electrical interconnection for the alternative sites. Water is potentially available from extensions from nearby water district facilities for sites Alt-1, Alt-2, Alt-3, Alt-6, and Alt-7. Groundwater is likely to be the source for the other sites.

Availability of the Site

Staff has investigated the availability of identified sites. All identified sites are potentially available.

General Plan and Zoning Consistency

Staff has evaluated the consistency of each alternative site with the applicable general plan and zoning. Each of the sites is consistent with general plan and zoning designations.

Not located adjacent to moderate or high density residential areas or to sensitive receptors (such as schools and hospitals) or to recreation areas.

All of the identified sites satisfy this criterion.

Summary

All of the identified alternative sites satisfy four of the five screening criteria. In regard to the fifth criterion, all of the sites satisfy two of the four infrastructure needs of the project (electricity and gas), but further investigation would be needed to determine whether the remaining two infrastructure needs (water supply and waste water disposal) could be satisfied.

EVALUATION OF ALTERNATIVE SITES

The applicant has stated eleven screening criteria for evaluation of alternative sites (TMPP 1999a, pp.5-1 to 5-3). Staff has made the following preliminary determinations regarding the extent to which the alternative sites are likely to satisfy these criteria.

1. To minimize the miles of new transmission line construction required to connect with the existing PG&E 230 kV transmission line. (This does not include the 60 linear miles of reconductoring of PG&E's transmission lines that the proposed project would require.)

   The new transmission lines for each of the identified alternatives would be less than four miles long and no reconductoring would be required. Some would parallel existing transmission lines and/or roads. Staff therefore considers that the identified alternative sites satisfy this objective. Staff also conducted a preliminary evaluation of the feasibility of electrical interconnection access for the ten alternative sites (see Appendix A).

2. To expedite construction and operation schedules by using an existing site under Three Mountain Power, LLC's control.

   None of the identified alternative sites are located on land under Three Mountain Power, LLC's control. However, staff does not believe that a reasonable range of alternatives can be developed if sites are limited to those under the applicant's control, so staff does not consider this to be a valid

3. To use readily available, secure water supply for the facility's cooling water, and a readily available means of handling wastewater discharge.

   Water appears to be potentially available for sites Alt-1, Alt-2, Alt-3, Alt-6, and Alt-7 by extension of local water district lines. Groundwater appears to be the most likely source for the other sites. Staff did not investigate means of handling wastewater discharge. However, the proposed project has been modified to minimize wastewater, and such a design is assumed to be applicable for any of the alternative sites.

4. To maximize compatibility with existing land use and zoning.

   All of the alternative sites are located on land designated for heavy industrial use.

5. To minimize the construction distance of the natural gas tie-in line to the PG&E natural gas transmission line.

   Sites Alt-4 through Alt-10 are located within four miles of a major PG&E natural gas transmission line. Sites Alt-1 through Alt-3 are located approximately eight miles from a major PG&E natural gas transmission line.

6. To minimize the Project's visibility and impacts on visual resources.

   Use of site Alt-1, Alt-2, or Alt-3 is not expected to cause significant visual impacts because of the industrial nature of nearby land uses. Use of the other sites may have the potential to cause significant visual impacts.

7. To maximize local community acceptability with consideration of noise, public health, worker safety, and hazardous materials handling issues.

   The factors that affect worker safety issues are not site-specific, so they are not relevant to an alternative site analysis. Many of the factors that affect issues regarding noise, public health, and hazardous materials handling are also not site-specific. Of those factors that are site-specific, the most important is the proximity of a site to people who would have long-term exposure. None of the identified alternative sites are located close to moderate or high density residential areas, so staff expects that potential noise, public health, and hazardous materials impacts could be mitigated to less than significant levels.

8. To minimize the impact on endangered species and their habitats. (This does not include the reconductoring of the 60 linear miles of PG&E's transmission lines.)

   Sites Alt-1, Alt-2, and Alt-3 are vacant, with nearby industrial uses. Sites Alt-4 through Alt-10 are in agricultural areas. Staff's expects that any potential impacts to endangered species or their habitats could be reduced to less than significant levels with appropriate mitigation.

9. To use a site with appropriate geological conditions, including geotechnical compatibility and consideration of local floodplain characteristics.

   None of the sites are near a recently active fault. None of the identified alternative sites is in a flood zone. Staff's preliminary evaluation did not reveal any substantial geotechnical or flooding compatibility issues.

10. To minimize the impacts on cultural resources.

    Regional information centers conducted records searches for the ten alternative sites and their linear facilities. Use of site Alt-9 could affect known cultural resources. Sites Alt-7 and Alt-10 and the natural gas and electric transmission line routes have a high potential for cultural resources. Further archival and field study would be required for any of the sites, and mitigation measures may be required.

11. To maximize the Project's ability to meet air quality requirements.

    Staff's alternative sites appear to meet this criterion because they avoid the problematic conditions in the Burney Basin.

SUMMARY

The alternative sites that staff identified appear to satisfy most (at least seven) of the eleven evaluation criteria: numbers 1, 4, 5, 7, 8, 9, and 11.

ENVIRONMENTAL COMPARISON OF ALTERNATIVE SITES

Staff's preliminary evaluation concludes that the ten alternative sites are approximately equal in regard to most environmental subjects. However, the sites differ in the following respects:

- Visual Resources: Sites Alt-1, Alt-2, and Alt-3 appear to have less potential for significant visual impacts than the other sites because heavy industry, including a power plant, exists in the immediate vicinity. Sites Alt-9 and Alt-10 appear to have less potential for significant visual impacts than sites Alt-4 through Alt-8 because they have some existing light industrial development in the vicinity.
- Cultural Resources: Site Alt-9 appears to have the greatest potential for impacts to cultural resources because of the proximity of known resources. Sites Alt-7 and Alt-10 appear to have greater potential for cultural resource

impacts than sites Alt-1 through Alt-6 and Alt-8 because of their high potential for cultural resources. However, staff expects that any such impacts could be mitigated to less than significant levels.

- Biological Resources: Site Alt-10 appears to have greater likelihood for impacts to biological resources than the other sites because it has potential habitat for endangered species. However, the site is large, so staff expects that the resources could be avoided or the impacts could be mitigated to less than significant levels.

- Water Resources: Sites Alt-1, Alt-2, Alt-3, Alt-6, and Alt-7 appear to have less potential than the other sites for water supply impacts because water may be obtainable by extending nearby existing water services rather than from groundwater.

Overall, sites Alt-1, Alt-2, and Alt-3 appear to be environmentally preferable to the other sites because:

- They have less potential for significant impacts to visual resources than the other sites; and

- They have similar potential for impacts to water resources as sites Alt-6 and Alt-7, and less potential for such impacts than sites Alt-4, Alt-5, Alt-8, Alt-9, and Alt-10.

OTHER ALTERNATIVES CONSIDERED

Staff's evaluation of technology alternatives, demand side management, distributed generation, and renewable resources concluded that these alternatives were not feasible and therefore did not qualify for more detailed evaluation. **ALTERNATIVES Table 2** summarizes staff's evaluation.

TECHNOLOGY ALTERNATIVES

DEMAND SIDE MANAGEMENT

One alternative to a power generation project could be programs to reduce energy consumption. These programs are typically called "energy efficiency," "conservation," or "demand side management" programs. One goal of these programs is to reduce overall electricity use; some programs also attempt to shift such energy use to off-peak periods.

The Energy Commission is responsible for several such programs, the most notable of which are energy efficiency standards for new buildings and for major appliances. The California Public Utilities Commission supervises various demand side management programs administered by the regulated monopolies, and many municipal electric utilities have their own demand side management programs. The combination of these programs constitutes the most ambitious overall approach to reducing electricity demand administered by any state in the nation.

Staff has already accounted for the effects all of the demand side management that is reasonably expected to occur in evaluating the future electricity needs of the Bay

Area and how much additional generation will be necessary. Therefore, demand side management is not an alternative to the proposed project. Furthermore, the Warren-Alquist Act prohibits the Energy Commission, in its alternatives analysis, from considering such conservation programs to be alternatives to a proposed generation project. (Pub. Resources Code, Section 25305(c).)

DISTRIBUTED GENERATION

Distributed generation is modular electric generation or storage located close to the point of use.

According to a recent study (Alderfer 2000),

"Environmentally-friendly renewable energy technologies such as wind turbines and photovoltaics and clean, efficient, fossil-fuel technologies such as gas turbines and fuel cells are among the fleet of new generating technologies driving the demand for distributed generation of electricity."

However, feasibility and environmental impacts are problems for these technologies. A number of serious barriers, including technical issues, business practices, and regulatory policies, make interconnection to the electrical grid in the United States difficult (Alderfer 2000).

Additional problems of specific types of distributed generation include the following.

Renewable Energy Sources

The high cost and limited dispatchability of renewable energy sources such as solar, wind, and biomass essentially inhibit their market penetration (Iannucci 2000).

Fuel Cells

The present high cost of fuel cells precludes their widespread use.

Other Fossil-fueled Systems

Microturbines and various types of engines can also be used for distributed generation. However, these fossil-fueled technologies have the potential for significant environmental impacts. Potential site-specific impacts include noise. Such systems also have the potential for significant cumulative air quality impacts because individually they are typically small enough to avoid the regulatory requirements for air pollution control. Therefore, use of enough of these systems to constitute an alternative to the proposed project would potentially cause significant unmitigated air quality impacts.

Summary

Distributed energy is not a feasible alternative to the proposed project because of technical, institutional, and regulatory barriers. Some types of distributed generation also are not feasible alternatives because they are not presently economical, and others are also not feasible because they have the potential to cause significant unmitigated environmental impacts.

ALTERNATIVES Table 2
Alternatives, Whether They Qualified for More Detailed Evaluation

ALTERNATIVE	QUALIFY?	IF NOT, WHY NOT?
Technology Alternatives		
Demand Side Management	No	• Already factored into electrical system planning
Distributed Generation	No	• Technological, market, and regulatory barriers; • Some types are infeasible; • Some types could cause significant environmental impacts
Renewable Resources	No	• Feasibility; • Availability, • Environmental impacts
Alternative Generation Capacities	No	• Feasibility
Alternative Sites		
Applicant's Alternative Sites		
Site B	No	• Greater environmental impacts
Site C	No	• Greater environmental impacts
Sites Identified by Staff		
Alt-1	Yes	-
Alt-2	Yes	-
Alt-3	Yes	-
Alt-4	Yes	-
Alt-5	Yes	-
Alt-6	Yes	-
Alt-7	Yes	-
Alt-8	Yes	-
Alt-9	Yes	-
Alt-10	Yes	-

ADDITIONAL TECHNOLOGICAL ALTERNATIVES

In the applicant's Detailed Mitigation Plan[6], the applicant proposed a hybrid cooling system (consisting of both wet and dry cooling towers) to reduce the consumption of ground water by the project. The applicant also proposed a crystallizer system to concentrate wastewater and eliminate the proposed evaporation ponds. Staff considered the applicant's proposed measures to mitigate potential water supply impacts, and treatment systems to address potential water quality impacts (see THE **WATER AND SOIL RESOURCES** section of the Final Staff Assessment). Staff believes these measures will address water supply and quality impact of the project.

[6] "Detailed Mitigation Plan and Analysis of Impact Assessments In Resource Areas Affected by the Mitigation Plan", August 21, 2000.

RENEWABLE RESOURCES

Staff examined the principal renewable electricity generation technologies that could serve as alternatives to the proposed project and do not burn fossil fuels. These technologies are geothermal, solar, hydroelectric, wind, and biomass. Each of these technologies could be attractive from an environmental perspective because of the absence or reduced level of air pollutant emissions. However, these technologies also cause environmental consequences and have feasibility problems.

Solar, wind, and hydroelectric resources require large land areas in order to generate 600 megawatts of electricity. Specifically, centralized solar projects using the parabolic trough technology require approximately 5 acres per megawatt. This 600 MW plant would require approximately 3,000 acres. Photovoltaic arrays require similar acreage per megawatt. Centralized wind generation areas generally require 40-50 acres per megawatt, with 600 megawatts requiring 24,000 - 30,000 acres. Large hydroelectric facilities generating 600 megawatts would inundate at least 30,000 acres with water. These technologies have the potential to cause significant land use, biological, cultural resource, and visual impacts. In summary, staff does not believe that these alternatives would be environmentally preferable to the proposed project.

Staff also considered the alternative of a biomass facility. However, biomass facilities are generally in the 3 to 10 MW range, must overcome significant fuel source reliability issues, have difficulty being economically competitive, and are typically worse from an air quality perspective than natural gas. For these reasons such a project would not be a feasible alternative, nor would it be likely to sufficiently satisfy project goals.

Severe resource constraints also exist for most of the renewable technologies. Geothermal resources sufficient to generate substantial amounts of electricity are not available. Opportunities for new hydroelectric, wind, or biomass generation are very limited.

THE “NO PROJECT” ALTERNATIVE

CEQA Guidelines and Energy Commission regulations require consideration of the "no project" alternative. This alternative assumes that the project is not built. It is compared to the proposed project and determined to be superior, equivalent, or inferior to it.

Not constructing and operating the proposed project would avoid all environmental impacts that the project would create, including increased groundwater use, air emissions, and the need for transmission line reconductoring. However, because staff believes that all environmental impacts can be mitigated to a level of less than significant, the benefits of the no project alternative would not be substantial.

REFERENCES

TMPP (Three Mountain Power Project/McFadden) 1999a. Submittal of the Three Mountain Power Application for Certification. Submitted to the California Energy Commission on March 3, 1999.

APPENDIX A

ELECTRIC TRANSMISSION INTERCONNECTION EVALUATION

Staff performed a screening level load flow analysis of the feasibility of electrical interconnection access for the ten alternative sites for the TMPP.[7] Staff found that all of the sites have feasible interconnection access. A potential benefit from use of any of the ten alternative sites which further analysis may confirm is a reduction of some portion of the reconductoring that the proposed project would require. The sites fall into three categories based on differences in their potential electrical interconnections.

Sites Alt-1, Alt-2, and Alt-3 are within five miles of PG&E's Cottonwood 230 kV substation. Initial loadflow analysis indicates that radial service into the substation is feasible in terms of normal and emergency thermal line loading.

Sites Alt-9 and Alt-10 are less than 17 miles from PG&E's Vaca-Dixon 230 kV substation. Initial loadflow analysis indicates that radial service into the substation is feasible in terms of normal and emergency thermal line loading. The analysis also indicates that interconnection to the Vaca-Dixon substation would lessen the proposed project's 500 kV impacts at PG&E's Round Mountain substation identified in PG&E's May 14, 1999 Preliminary Facilities Study for TMPP.

Sites Alt-5 through Alt-8 are located within the 230 kV transmission line corridor between the Cottonwood and Vaca-Dixon substations. A radial tie to one of these substations from any of the sites would be more than 40 miles long. However, the sites are within five miles of the existing 230 kV lines. None of the four PG&E 230 kV transmission lines between these substations can accommodate an addition of the 530 MW that the proposed project would produce. One option that is feasible in regard to the thermal capacity of the lines is two-line looped service using the Cottonwood - Glenn - Vaca-Dixon line and the Cottonwood - Vaca-Dixon line.

Table 1 presents staff's estimates of the interconnection costs for each of the sites.

[7] Obtaining more certainty regarding interconnection feasibility would require detailed analysis of substation line and bus access, dynamic stability, short circuit duty, and post-transient voltage impacts.

Table1
Three Mountain Power Project Alternative Site Cost Summary

Site Number	Nearby City	Near Existing PG&E Substation	Existing PG&E Transmission Line Corridors Used For 'Loop' Interconnection	Estimated Length of New Outlet Line (Linear miles)	Estimated Length of New Outlet Line (Line miles)	Estimated Length of Reconductoring (Linear miles)	Estimated Total Line Costs ($1000)	Estimated Termination Points and Switching Station Cost ($1000)	Estimated Total Cost ($1000)
1	Anderson	Cottonwood	Cottonwood - Round Mountain	1.63	3.26	1.24	$1,632	$11,000	$12,632
2	Anderson	Cottonwood	Cottonwood - Round Mountain	0.93	1.86	1.24	$1,060	$11,000	$12,060
3	Anderson	Cottonwood	Cottonwood - Round Mountain	0.47	0.93	1.24	$680	$11,000	$11,680
4	Willows	Glen	Cottonwood -Vaca Dixon	1.09	2.17	0.00	$889	$11,000	$11,889
5	Willows	Glen	Cottonwood -Vaca Dixon	1.40	2.79	0.00	$1,143	$11,000	$12,143
6	Maxwell	Logan Creek	Cottonwood -Vaca Dixon	3.23	6.46	0.00	$2,646	$11,000	$13,646
7	Maxwell	Logan Creek	Cottonwood -Vaca Dixon	3.32	6.63	0.00	$2,715	$11,000	$13,715
8	Williams	Cortina	Cottonwood -Vaca Dixon	5.58	11.16	0.00	$4,571	$11,000	$15,571
9	Fairfield	Vaca Dixon	Contra Costa - Vaca Dixon	0.33	0.66	16.10	$4,148	$11,000	$15,148
10	Fairfield	Vaca Dixon	Contra Costa - Vaca Dixon	0.50	0.99	15.54	$4,149	$11,000	$15,149
1B	Anderson	Cottonwood	----	2.17	2.17	0.00	$889	$7,700	$8,589
2B	Anderson	Cottonwood	----	1.78	1.78	0.00	$730	$7,700	$8,430
9B & 10B*	Fairfield	Vaca Dixon	----	13.60	13.60	9.16	$7,334	$7,700	$15,034

Alternative #1 - 10: These alternatives loop plant outlet lines to two existing PG&E 230 kV transmission lines. Two double circuit outlets are used.
Alternative #1B, 2B, 9B, 10B: These alternatives use a single double circuit outlet line to connect the project to a PG&E substation.

TMPP based estimated unit cost:	Reconductoring	$240,909 per mile for a double-circuit line
	New Line	$409,545 per mile for a double-circuit line

* 9B & 10B trigger potential reconductoring of only one circuit. Reconductoring costs for all other alternatives/connection options based on reconductoring two circuits.
Assume line reconductor unit cost reduced 20% for 9B and 10B.

Source: CEC Staff

BIOLOGICAL RESOURCES

Testimony of Linda Spiegel

INTRODUCTION

This section provides the Energy Commission staff's analysis of potential impacts to biological resources resulting from the construction and operation of the Three Mountain Power Project (TMPP) proposed by Three Mountain Power, Limited Liability Company (TMP). This analysis addresses potential impacts to state and federally listed species, species of special concern, and areas of critical biological concern; describes the biological resources of the project site and at the locations of appurtenant facilities; determines the need for mitigation and the adequacy of mitigation proposed by the applicant, and; where necessary, specifies additional mitigation measures to reduce identified impacts to less than significant levels. It also determines compliance with applicable laws, ordinances, regulations and standards (LORS), and recommends conditions of certification.

This analysis is based, in part, upon information provided in the TMP's Application for Certification (AFC) (TMP 1999a), Supplemental Filings (TMP 1999b), site visits, workshops, staff data requests and TMP responses (TMP 1999c-i, 2000a,b), and discussions with various agency representatives and species experts.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

FEDERAL

ENDANGERED SPECIES ACT OF 1973

Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq., designate and provide for protection of threatened and endangered plant and animal species, and their critical habitat.

MIGRATORY BIRD TREATY ACT

Title 16, United States Code, sections 703 - 712, prohibits the take of migratory birds.

BALD EAGLE PROTECTION ACT

Title 16 United States Code, section 668, prohibits take and transport of bald and golden eagles.

CLEAN WATER ACT

Title 33, section 1344 et seq, prohibits the discharge of dredge or fill activities within waters of the U.S. without a Section 404 permit. Section 401 et seq, requires water quality assessment when using 404 permits and for discharges into waters of the U.S.

STATE

CALIFORNIA ENDANGERED SPECIES ACT OF 1984

Fish and Game Code sections 2050 et seq. protects California's rare, threatened, and endangered species.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

California Environmental Quality Act Guidelines Title 14, sections 15000, et. seq.

NEST OR EGGS – TAKE, POSSESS, OR DESTROY

Fish and Game Code section 3503 protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs or any bird.

BIRDS OF PREY OR EGGS – TAKE, POSSESS, OR DESTROY

Fish and Game Code section 3503.5 protects California's birds of prey and their eggs by making it unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird.

MIGRATORY BIRDS – TAKE OR POSSESSION

Fish and Game Code section 3513 protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame bird.

FULLY PROTECTED SPECIES

Fish and Game Code sections 3511, 4700, 5050, and 5515 prohibits take of animals that are classified as Fully Protected in California.

SIGNIFICANT NATURAL AREAS

Fish and Game Code section 1930 et seq. designates certain areas such as refuges, natural sloughs, riparian areas and vernal pools as significant wildlife habitat.

STREAMBED ALTERATION AGREEMENT

Fish and Game Code section 1600 et seq. requires California Department of Fish and Game to review project impacts to waterways, including impacts to vegetation and wildlife from sediment, diversions and other disturbances.

NATIVE PLANT PROTECTION ACT OF 1977

Fish and Game Code section 1900 et seq. designates state rare, threatened, and endangered plants.

CALIFORNIA CODE OF REGULATIONS

Title 14, sections 670.2 and 670.5 list animals of California designated as threatened or endangered.

LOCAL

SHASTA COUNTY GENERAL PLAN

Fish and Wildlife Element sections 65302[d] and 65560, requires proposed projects to demonstrate a high degree of compatibility with any listed species habitat it may affect and designates critical deer wintering areas which provide protection for deer herds.

SETTING

REGIONAL DESCRIPTION

The proposed project site is located in the Burney Valley, in northeastern Shasta County, approximately 45 miles east of Redding and one mile northeast of Burney. The plant site, switchyard, transmission tie-in line, natural gas pipeline, water treatment system, and water pipeline routes are located between the towns of Burney and Johnson Park. The project will require reconductoring of two existing 230 kV transmission lines for a distance of about 60 linear miles: 19 miles from the new transmission line tie-in to the Round Mountain Substation; 9 miles to the Pit 3 Substation; and, 32 miles from the Round Mountain Substation to the Cottonwood Substation, located south of the city of Anderson. The project description in the AFC states that 88 miles of transmission line will be reconductored; however, that accounts for 28 miles of a double circuit line (counted as 56 miles) and 32 miles of a single circuit for a total linear distance of 60 miles.

The project is located in the southeast corner of the Cascade Range that is in a transitional zone between the Cascades, Sierra Nevada, Basin and Range, and Modoc Plateau geomorphic provinces. Biotic communities in Burney Valley include ponderosa pine forest, volcanic talus, freshwater marsh, montane chaparral, and annual grasslands. The area is surrounded by volcanic cinder cones and mountains (TMP 1999a, Figure 6.13-1). Lake Britton, Burney Falls, and the Pit River are located approximately 5 miles to the north. Hat Creek, including Crystal Lake, is about 4.5 miles east. Sensitive natural communities in the area include the Pit River drainage and northern basalt flow vernal pool. The Burney watershed consists predominately of volcanic rocks from relatively young, highly fractured volcanic flows. This volcanic parent material creates highly permeable soils. The Burney aquifer is also composed of these fractured lava flows and groundwater emerges as clear, cold water springs. This unique ecosystem is one of the largest spring systems in the United States. The springs provide unique habitat for many sensitive and listed species. The groundwater is recharged solely through precipitation which rapidly percolates to the aquifer system with little or no filtration. The aquifer system is regionally unconfined and the quantity of groundwater stored in the fractures is limited. Therefore, the aquifer is susceptible to rapid declines in groundwater levels during drought conditions and is vulnerable to contamination from unfiltered sources.

BIOLOGICAL RESOURCES Table 1
Special Status Species Known or Potentially Occurring in the Burney Watershed Area

Common Name	Scientific Name	Status[1]	Potential/Area
Fish			
Rough sculpin	*Cottus asperrimus*	-/T	Clear springs
Bigeye marbled sculpin	*Cottus klamlthensis macrops*	CSC	Clear springs
Invertebrates			
Shasta crayfish	*Pacifastacus fortis*	E/E	Clear springs
Vernal pool fairy shrimp	*Branchinecta lynchi*	T/-	Vernal pools
California linderiella	*Linderiella occidentalis*	SC/-	Vernal pools
Vernal pool tadpole shrimp	*Lepidurus packardi*	E/-	Vernal pools
Terrestrial Mollusks			
Oregon shoulderband snail	*Helminthoglypta herleini*	ROD S&M	Springs less than 1 cfs
Klamath shoulderband snail	*Helminthoglypta talmadgei*	ROD S&M	Springs less than 1 cfs
Siskiyou sideband snail	*Monadenia chaceana*	ROD S&M	Springs less than 1 cfs
Church's sideband snail	*Monadenia churchi*	ROD S&M	Springs less than 1 cfs
Shasta sideband snail	*Monadenia troglodytes trogoldytes*	FSC, ROD S&M	Springs less than 1 cfs
Wintu sideband snail	*Mondenia troglodytes wintu*	FSC, ROD S&M	Springs less than 1 cfs
Shasta chaparral snail	*Trilobopsis roperi*	ROD S&M	Springs less than 1 cfs
Tehama chaparral snail	*Trilobopsis tehamana*	ROD S&M	Springs less than 1 cfs
Pressley Hesparian snail	*Vespericola pressleyi*	ROD S&M	Springs less than 1 cfs
Shasta Hesparian snail	*Vespericola shasta*	ROD S&M	Springs less than 1 cfs
Papilose tail-dropper slug	*Prophysan dubium*	ROD S&M	Springs less than 1 cfs
Aquatic Mollusks			
Potem pebblesnail	*Fluminicola n. sp.*	ROD S&M	Springs &River
Flat-top pebblesnail	*Fluminicola n. sp*	ROD S&M	Springs &River
Shasta springs pebblesnail	*Fluminicola n. sp*	ROD S&M	Springs &River
Disjunct pebblesnail	*Fluminicola n. sp*	ROD S&M	Springs &River
Globular Pebblesnail	*Fluminicola n. sp*	ROD S&M	Springs &River
Umbilicate pebblesnail	*Fluminicola n. sp*	ROD S&M	Springs &River
Lost Creek pebblesnail	*Fluminicola n. sp*	ROD S&M	Springs &River
Nugget pebblesnail	*Fluminicola seminalis*	ROD S&M	Springs &River
Scalloped juga snail	*Juga occata*	FSS	Springs &River
Topaz Juga	*Juga acutifilosa*	FSS	Springs &River
Cinnamon juga snail	*Juga n. sp*	ROD S&M	Springs &River
Canary duskysnail	*Lyogyrus n. sp*	ROD S&M	Springs &River
Knobby rams-horm snail	*Vorticifex n. sp.*	ROD S&M	Springs &River
Great Basin rams-horn	*Helisoma newberryi newberryi*	FSS	Springs &River
California floater mussel	*Anodonta californiensis*	FSC. FSS	Lake Britton & River proper
Montane peaclam	*Pisiduim ultramontanum*	FSC, FSS	River proper & margins
Amphibians			
Shasta salamander	*Hydromantes shastae*	CT	limestone
Foothill yellow-legged frog	*Rana boylii*	FSC, FSS. CSC	River
Cascade frog	*Rana cascade*	FSC. FSS. CSC	River proper & margins
Northern leopard frog	*Rana pipiens*	FSS, CSC	River proper & margins
Spotted frog	*Rana pretiosa*	FSS, CSC	River proper & margins
Reptiles			
Northwestern pond turtle	*Clemmys marmorata marmorata*	FSS, CSC	Ponds & streams

[1] ROD S&M:U.S. Forest Service Record of Decision C-3 Survey and Manage Species
FSC: Federal Species of Concern
FSS: U.S. Forest Service Sensitive
E: Endangered
CT: California State Threatened
CSC: California Species of Special Concern

TMP provided lists of sensitive plant and animal species potentially occurring within the site and vicinity (TMP 1999a, Table 6.13-1 and Appendix I, Table 4-1, Table 4-2; TMP 1999b, Table 2-1). In a letter dated January 11, 2000 (Ellis 2000), Dr. Ellis, an aquatic ecologist who specializes in rare species, provided a list of endemic, sensitive species that could occur in the project area (**Biological Resources Table 1**). Each of the species identified by Ellis is aquatic-dependent or aquatic - associated and occurs in or near springs, streams, or rivers. The area is also renowned for its trout fishing, and supports both stocked and the Pit River strain of rainbow trout, one of the few remaining wild or pure strains of trout in the state (Cook 2000).

SITE VICINITY

The power plant, switchyard, and gas and water pipeline routes are located within ponderosa pine forest habitat (TMP 1999a, Figure 6.13-1). The power plant site proper is disturbed by current activities associated with a 10 MW biomass power plant. Wildlife use around the site would be minimal and include black-tailed mule deer, common raven, coyote, hares, and various raptors including red-tailed hawk, northern harrier, cooper's hawk, and American kestrel.

POWER PLANT SITE, LAYDOWN, AND SWITCHYARD

The power plant will occupy 10.2 acres of an existing disturbed 40-acre site, zoned for general industrial use. A portion of the site is occupied by the 10 MW Burney Mountain Power biomass plant. The laydown area and switchyard will be located on compacted soil within the 40-acre site. The access road is existing.

NATURAL GAS PIPELINE

The natural gas pipeline route (Alternative A in the AFC) follows the access road from the plant site to Highway 299 for about 670 feet and travels east through ponderosa pine habitat for the remaining 2,230 feet. A 3-acre laydown area on each end of the pipeline will be located in disturbed areas (TMP 1999c, Response to Data Request #2, page 3).

WATER SUPPLY LINE AND WASTEWATER DISPOSAL

The project will use a parallel hybrid wet and dry cooling system that will use both reclaimed and ground water (TMP 2000). Reclaimed water for the cooling system and potable water will be supplied by Burney Water District via a 500-foot line from the treatment plant located just southwest of the power plant site. Ground water will be supplied from two new wells and about 4,700 feet of a new water line. The water supply line travels from the southwest end of the site to Highway 299 (1,070 feet), then south - southeast through ponderosa pine habitat for about 4,210 feet to the Burney Water District storage facility.

A crystallizer will be installed to remove the solids from the process water and produce solid waste that will be trucked off-site to an appropriate waste facility. No percolation or evaporation ponds will be used.

Storm water will be stored in a 15 x 200-foot depression at the northwest corner of the plant and will be discharged from a pipe into the existing railroad right-of-way (TMP 1999g, Response to Data Request #65; Draft Erosion Control and Stormwater Management Plan, page 2).

TRANSMISSION LINES

A new transmission line will be built from the power plant to an existing PG&E 230 kV line to the north. The new line begins at a 2-acre switchyard site located at the northeast corner of the property. The switchyard site is disturbed. The line runs through ponderosa pine habitat along the northern boundary of the property for 800 feet, then turns north and follows an existing railroad right-of-way and a 60 kV distribution line adjacent to ponderosa pine habitat for 1,800 feet.

Approximately 60 miles of an existing 230 kV line will be reconductored. From the power plant site the line travels west about 5 miles then splits north for 9 miles to the Pit 3 Substation and west 14 miles to the Round Mountain Substation. From Round Mountain, the line runs south for 32 miles to the Cottonwood Substation. The 230 kV transmission line transverses several habitat types. The right of way is periodically cleared by PG&E and consists mostly of chaparral, small trees, and grassland. Primary habitats from the plant site to the Round Mountain substation are mixed coniferous forest, montane chaparral, wet montane meadows, and burned ponderosa pine forest (TMP 1999b, Figures 1 – 31). Primary habitats from the Round Mountain substation to the Cottonwood substation include burned and unburned ponderosa pine forest, chaparral, grassland, blue oak – foothill pine woodland, mixed evergreen forest, wet meadow, northern volcanic vernal pools, and valley oak riparian (TMP 1999b, Figures 31 – 85). Primary habitats along the spur to Pit 3 substation include ponderosa pine forest, wet meadow, chaparral, and mixed coniferous forest (TMP 1999b, Figures 86 – 97). The transmission line route crosses 2 rivers and 14 creeks (TMP 1999b, Figure 6.13-4; Appendix I-2, page 1-2-1). Approximately 1.5 miles of the transmission line cross (TMP 1999b, Figures 99, 100, 104) Shasta National Forest lands (TMP 1999b, Figures 99, 100, 102, 103, and 104; Figures 99, 100, and 104 show it as Lassen National Forest).

Portions of the line cross critical deer wintering range (TMP 1999a, Figure 6.13-5; TMP 1999b, Figure 2.1). Several raptor species are likely to inhabit the surrounding areas. Osprey, golden eagle, bald eagle, red-tailed hawk, great-horned owl, and common raven nests can occur on the towers. A complete list of sensitive species known to occur in the vicinity of the transmission line corridor were provided by the applicant (TMP 1999b, Appendix I-2, Tables 2-1, 2-2, and 2-3). Species observed and/or with the highest potential to occur along the corridor are provided in **Biological Resources Tables 2 and 3**.

BIOLOGICAL RESOURCES Table 2
Sensitive Plant Species – Potential Occurrence Along Transmission Line Corridor

Common Name	Scientific Name	Status[1] Fed/State/CNPS	Potential/Area
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	--/E/1B	Moderate. seasonal wetlands n. of Panorama Point Rd & in vernal pool on access roads on plains e. of Oak Run Rd
Slender Orcutt grass	*Orcuttia tenuis*	T/E/1B	Moderate. Vernal pools just n.of Panorama Point Rd, on access roads on plains e. of Oak Run Rd, n. of Burney on w. edge of Goose Valley.
Silky cryptantha	*Cryptantha crinita*	SC/--/1B	Present. Reported at Balls Ferry. Could also occur in streams between Sac River, plains s. of Oak Run, drainages s. of Panorama Point Rd and n. of Cottonwood Substation.
Woolly meadow foam	*Limnanthes floccosa* spp. *Floccosa*	--/--/1B	Present. Found in overflow channel of Dry Cr, s. of Dersch Rd. Potential in wet swales and at edges of meadows from n. Sac River to plains e. of Oak Run Rd.
Ahart's paronychia	*Paronychia ahartii*	SC/--/1B	High. Barren edges of swales and vernal pools, mainly in Millville Plains and on plains n. of Sac R.
Butte County fritillary	*Fritillaria eastwoodiae*	SC/--/1B	High. Oak Woodlands & coniferous forest on slopes between Whtmore & Oak Run.
Red Bluff dwarf rush	*Juncus leiospermus* var. *leiospermus*	--/--/1B	Present. Found n. of Sac River. Potential in swales and pools on plains between Sac River & Oak Run & ne of Burney on edge of Goose Valley.
Legenere	*Legenere limosa*	SC/--/1B	Moderate. Wetlands n. of Panorama Point Rd, low potential in vernal pools on plains e. of Oak Run.
Profuse-flowered pogogyne	*Pogogyne floribunda*	--/--/1B	Moderate. Vernal pool n. of Burney in e. Goose Valley.
Long-leaved starwort	*Stellaria longifolia*	--/--/2	Moderate. Vernal pool n. of Burney in e. Goose Valley.
Fox sedge	*Carex vulpinoidea*	--/--/2	Moderate. Wetlands & marshes n. of Panorama Point Rd & n. of Kimberly Rd. to Sac River.
Pointed broom sedge	*Carex scoparia*	--/--/2	Present. Known to occur in wetlands & marshes n. of Panorama Point Rd. Moderate in wetlands n. of Kimberly Rd to Sac River.
Long-haired star tulip	*Calochortus longibarbatus* var. *longibarbatus*	SC/--/1B	Moderate. Vernal pool n. of Burney on e. edge of Goose Valley.
Shasta Clarkia	*Clarkia borealis* ssp. *arida*	SC/--/4	Moderate. N. & s. of Highway 44

[1]Federal Status
- E-Endangered
- T-Threatened
- SC- Species of Special Concern

State Status
- E-Endangered
- T-Threatened
- CSC-California Species of Special Concern

California Native Plant Society (CNPS)
- 1B-Rare, threatened, or endangered in California and elsewhere
- List 2-Rare, threatened, or endangered in California, more common elsewhere

4-limited distribution – A watch list

BIOLOGICAL RESOURCES Table 3
Sensitive Wildlife Species – Potential Occurrence Along Transmission Line Corridor

Common Name	Scientific Name	Status[1] Fed/State	Potential/Area
Vernal pool fairy shrimp	*Branchinecta lynchi*	T/--	Moderate. Stillwater Plains to west in vernal pools.
Vernal pool tadpole shrimp	*Lepidurus packardi*	E/--	Moderate. Stillwater Plains to west in vernal pools.
Shasta crayfish	*Pacifastacus fortis*	E/E	Present .Pit River. High in streams.
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T/--	Moderate. Elderberries e. bank of Sac River
Central Valley steelhead	*Oncorhynchus mykiss*	PE/--	High. Streams
Chinook salmon-winter run	*Oncorhynchus tshawytscha*	E/E	Moderate. Sac River
Hardhead	*Mylopharadon conocephalus*	--/CSC	Present. Pit River. Streams
Bigeye marbled sculpin	*Cottus klamathensis macrops*	--/CSC	Present. Pit River drainage
Rough sculpin	*Cottus asperrimus*	-/T	Present. Pit River drainage
Western spadefoot toad	*Scaphiopus hammondii*	SC/CSC	Unknown. Potential in shallow pools.
Foothill yellow-legged frog	*Rana boylii*	SC/CSC	Moderate. Streams
Northwestern pond turtle	*Clemmys marmorata marmorata*	SC/CSC	High. Ponds and streams.
American bittern	*Botaurus lentiginosus*	MNBMC/--	Moderate. Marshes from Panorama Point to Balls Ferry
Osprey	*Pandion haliaetus*	SC/Sensitive	Present. Nests on towers.
White-tailed kite	*Elanus leucurus*	MNBMC/Protected	Moderate. Foothill grasslands and riparian habitats.
Bald eagle	*Haliaetus leucocephalus*	T/E	Present. Forests and waters.
Northern harrier	*Circus cyaneus*	--/CSC	High. Variety of habitat types.
Sharp-shinned hawk	*Accipiter striatus*	--/CSC	High. Coniferous forest, mixed woodlands.
Cooper's hawk	*Accipiter cooperii*	--/CSC	High. Mixed woodlands and streamside groves.
Northern goshawk	*Accipiter gentilis*	SC/CSC	High. Coniferous dominated mixed forest.
Golden eagle	*Aquila chrysaetos*	SC/Protected	Moderate. Ledges, large trees, open areas.
Merlin	*Falco columbarius*	--/CSC	High. Open habitats in winter.
Long-eared owl	*Asio otus*	--/CSC	Moderate. Wooded habitats.
Spotted owl	*Strix occidentalis*	T/CSC	Present. Wooded habitats.
Vaux's swift	*Chaetura vauxi*	--/CSC	High. Open forest, from Round Mtn to Pit River.
Olive-sided flycatcher	*Contopus cooperi*	MNBMC/--	Present. Coniferous forest.
Purple martin	*Progne subis*	--/CSC	Present. Burned forest s. Goose Crk
Bank swallow	*Riparia riparia*	--/T	Present. Vertical banks near water.
Loggerhead shrike	*Lanius ludoviciana*	SC/CSC	High. Forest, Oak, Riparian woodlands, grasslands.
Yellow warbler	*Dendroica occidentails*	--/CSC	Moderate. Riparian, chaparral, montane coniferous.
Hermit warbler	*Dendroica occidentails*	MNBMC/--	Present. Mixed conifer forest.
Yellow-breasted chat	*Icteria virens*	--/CSC	High. Riparian, young chaparral.
Grasshopper sparrow	*Ammodramus savannarum*	MNBMC/--	Moderate. Grasslands
Tricolored blackbird	*Aegelaius tricolor*	SC/CSC	Moderate. Marsh w/cattails or bulrushes occasionally other dense shrubs e.g. willows
Pallid bat	*Antrozous pallidus*	--/CSC	High. Oak run to Round Mtn.
Fringed myotis	*Myotis thysanodes*	SC/--	High. Roosts in caves, bridges.
Long-legged myotis	*Myotis volans*	SC/--	High. Round Mtn to Pit River Woodland, forests >4000ft.
Yuma myotis	*Myotis yummanensis*	SC/CSC	High. Open forests and woodlands near water.
Marysville kangaroo rat	*Dipodomys californicus eximus*	SC/CSC	High. Grasslands Cottonwood to Millville Plains.

[1]Federal Status
- E-Endangered
- T-Threatened
- SC- Species of Special Concern
- MNBMC-USFWS Migratory Nongame Bird of Management Concern

State Status
- E-Endangered
- T-Threatened
- CSC-California Species of Special Concern

IMPACTS

PROJECT SPECIFIC DIRECT AND INDIRECT IMPACTS

Potential impacts to biological resources from the construction, operation, and maintenance activities of the proposed project include:

- Permanent loss of habitat from the project footprints and access roads
- Temporary loss of habitat from construction of the linear facilities
- Habitat degradation from power plant water use
- Displacement of wildlife during construction activities
- Disturbance to nesting raptors
- Bird collisions with transmission lines

POWER PLANT SITE AND NEW LINEAR FACILITIES

PERMANENT AND TEMPORARY LOSS OF HABITAT

The proposed project will result in the direct permanent loss of 18.78 acres of ponderosa pine habitat from the footprints of the project components and direct temporary loss 0.77acres of grassland habitat from construction activities (**Biological Resources Table 4**). The applicant proposes to re-vegetate areas disturbed with a grassland mixture and to remove any re-growth of brush and trees. Therefore, impacts to ponderosa pine habitat are considered permanent and impacts to grassland habitat are considered temporary. The power plant site proper will be located on an industrial site. Wildlife use of the immediate vicinity surrounding the proposed power plant site is minimal. The loss of approximately 19 acres of ponderosa pine and grassland habitat will not cause a significant impact.

BIOLOGICAL RESOURCES Table 4
Permanent and Temporary Habitat Disturbance (acres) from the Project

Facility	Area Required	Existing Disturbed	Permanent Ponderosa Pine	Temporary Grassland
Power Plant/laydown	10.2	9.2	1	
Water Supply	14.09	0	2.7	0.64
New T-Line	17.9	6	11.9	
Switchyard	2	2		
Linear laydown	18	18		
Gas Supply	3.91	0.6	3.18	0.13
Totals:	**66.1**	**35.80**	**18.78**	**0.77**

POWER PLANT WATER USE

Three Mountain Power will build the new facility and retrofit the existing Burney Mountain Power plant with a wet/dry cooling system. Water for the cooling towers will be supplied by two new wells located south of the site and by reclaimed water from Burney Water District. The Burney Water District will supply approximately 300 acre feet per year (AFY) of reclaimed water; however, up to 500 AFY may be supplied. A total of 950 AFY of groundwater will be supplied by project wells. Of this amount, 350 AFY is currently used by Burney Mountain Power but some (~125 AFY) of this amount will be made available to Three Mountain Power once Burney Mountain Power has been changed to a wet/dry cooling system. If Burney Mountain power is not operating, all 350 AFY will be used by Three Mountain Power. Because the 300 AFY of reclaimed water would have been supplied to the groundwater via the percolation ponds at the wastewater treatment facility, a total of 1,250 AFY will be removed from the aquifer. This represents 900 AFY of new groundwater use (1,250 AFY – 350 AFY currently being used by Burney Mountain Power).

Evaluations of groundwater resources in the Burney area watershed were performed by in 1988 by CH2M Hill and in 1999 and 2000 by TMP (CH2M Hill 1988, TMP 1999a, Appendix J, SHN 1999, Lawrence and Associates/Dames and Moore 2000)). Lawrence and Associates concluded that the Burney groundwater basin receives approximately 169,000 acre-feet per year of recharge, 20,000 acre feet per year is lost to consumptive use, and 149,000 acre-feet per year discharges from the basin primarily via Burney Falls and Burney Creek. Staff's preliminary assessment (LDBond and Associates 2000) differed; this water budget reported inflows from the adjacent Hat Creek water basin, less outflows from evapotranspiration, and concluded that the total basin discharge could be up to 249,000 AFY (100,000 AFY more than TMP's assessment). Although, Lawrence and Associates/Dames and Moore (2000) conclude that groundwater is not exchanged between the Burney Basin and the Hat Creek Basin, data presented by Rose et al. (1995) indicates that there is not a clear geologic, and therefore hydrologic, barrier to groundwater flow between these water basins. Several properties, such as storage capacity, hydraulic conductivity, and porosity, are unknown or continue to be debated

The aquifer in this area is complex. Groundwater occurs and flows through preferential pathways such as fracture and fault zones. There is a high level of interconnectivity in the larger regional groundwater system and stored groundwater is limited. . Groundwater in the basin emerges where fractures terminate at the land surface as clear, cool springs. This unique ecosystem represents one of the largest spring systems in the United States. The cool temperatures and high water quality of the springs provide islands of habitat that support several endemic species. Degradation of these spring habitats can result from decreases in flow and concomitant degradation in water quality, increased temperatures and siltation, and reduced habitat or wetted area.

The sensitive resources listed in **Biological Resources Table 1** are dependent on the springs, streams or rivers in the area. Most of these are endemic to the local area and their small and isolated habitats put them at a higher risk of extinction and make them vulnerable to adverse impacts. Four are federally and/or state endangered or threatened, seven are federal species of concern, six are state species of special concern, nine are U.S. Forest Service sensitive species, and twenty-two are U.S. Forest Service Record of Decision C-3 Survey and Manage

Species (ROM S&M). The Northwest Forest Plan (1999) includes measures to protect these species and the Standards and Guidelines (Attachment A of the Northwest Forest Plan) require identification, mapping, and management of known sites. The Northwest Forest Plan applies to Forest Service and Bureau of Land Management Lands. The aquifer that will supply the power plant also supplies the regional area which includes US Forest Service lands downgradient of the well sites

The federally and state endangered Shasta crayfish, the only surviving native crayfish in California, has a distribution that is limited to the midsections of the Pit River drainage, primarily the Fall River and Hat Creek subdrainages (USFWS 1998). Habitat requirements of the Shasta crayfish are cool, clear,. spring-fed headwaters that include volcanic cobbles and boulders. The primary threat to the Shasta crayfish is the invasion of the exotic signal crayfish. However, hydroelectric development, past fisheries management, and other developments that have altered the ecosystem and/or resulted in changes to the system's temperature, clarity, or discharge of the springs or water in Shasta crayfish habitat are also responsible for population declines.

In May and June 2000, Ganda and Associates (2000) conducted a cursory level survey of springs and reaches that could be impacted by the project. However, the presence of terrestrial mollusks could not be confirmed as survey protocols (surveys conducted after the first rain) were not followed or surveys were not conducted in some areas due to time constraints. Surveys for Shasta crayfish were only based on habitat conditions as permits to survey for this species were not acquired. Springs and reaches located north and northeast of the project site that could be impacted by groundwater pumping include: Burney Creek, Burney Falls, Rim of the Lake, Salmon Springs, Old Mine Pond, Sand Pit Road, Hat Creek Park South, Rocky Ledge, and Canal (Ganda and Associates 2000, Appendix G, Table 9). Results of these surveys found the occurrence of four aquatic mollusks that are potentially special status species. Confirmed or potential for occurrence of sensitive aquatic species including rough and bigeye marble sculpins and aquatic and terrestrial mollusks were documented in all but one of these. Shasta crayfish were not observed in the springs directly north and northeast of the project; however, due to suitable habitat and proximity to adjacent historical habitat, potential for occurrence was documented at Salmon Springs, Rim of the Lake Springs, Burney Creek, and Rocky Ledge Spring (Ganda and Associates 2000). Crystal Lake springs, located in the Hat Creek subdrainage, supports one of the five remaining population centers of Shasta Crayfish (USFWS 1998).

An assessment of impacts to the springs reported in both Garcia and Associates (2000) and in Lawrence and Associates/Dames and Moore (2000) concluded that withdraw of water for TMP use would result in minor changes to the springs. During years of normal precipitation, TMP pumping would cause a 0.68% decrease in spring flow, a 0.03 to 0.26% decrease in wetted area, and reductions in average velocity of 0 to 0.0095 feet per second (fps)

Garcia and Associates (2000) and in Lawrence and Associates/Dames and Moore (2000) concluded that withdraw of water for TMP use during drought years would also have a negligible effect on spring flows. During drought, reduction in flows would be 0.61 to 1.52%, reduction in wetted areas would be 0.04 to 0.34%, and reduction in velocities would be 0 to 0.0123 fps.. Using flows at Burney Falls during the driest year of a 5-year drought and factoring an additional consumptive use in the year 2030 of 1,300 AFY, TMP determined that percent reduction in Burney Falls would be 34% without TMP water use and 35% with TMP water use. The difference of 0.68% was than assumed to be the added impact from TMP water use. This value was then used as the change in discharge for all other springs.

Staff disagrees with this analysis as the calculations were based on assumptions that are not supported by staff and are contradicted by other reports (Rose et. al 1995). First, it has been shown that small springs and springs located at elevations near the elevation of the ground water table react differently than large springs such as Burney Falls and experience a more rapid reduction in flows during drought conditions. Also, during that 5-year drought (which is not the worse drought on record), flows to two large springs that were monitored in the Hat Creek area (Crystal Lake and Fall River) were reduced by 50%, Salmon Springs was reduced by 60%, and numerous smaller springs (less than 1 cubic-foot per second) dried (Ellis pers comm 2000a, 2000c). These reductions greatly exceed the 35% reduction estimated by TMP's consultants. Further, while the Lawrence and Associates/Dames and Moore (2000) report calculated percent reduction in flows based on 900 AFY averaged over a 12-month period, the majority of TMP's water use (537 AFY) will occur during the warmer months (June-August) when no groundwater recharge is occurring and pumping would have the greatest impact on the hydrology (TMP 2000, Table 2.1-5).

Water Resources staff has concluded that the complexity of the aquifer and lack of information on preferential flow paths within the aquifer prevents a clear determination of changes in spring hydrology from TMP's water use. However, using all of the available data, water resource staff has estimated that reductions in water supply, and therefore spring flow, from TMP water use alone would be about 1% during normal conditions and 2% during drought. Due to the uncertainty of whether Hat Creek and Burney Basin are hydrologically distinct, staff assumes reductions in flows to Crystal Lake springs will be similar. These negligible reductions in flow would not result in adverse habitat changes to the springs. Therefore, TMP water use alone will not result in significant direct impacts to the aquatic – associated species and potential Shasta crayfish habitat or to known Shasta crayfish habitat. An evaluation of cumulate impacts is provided under a separate section (see CUMULATIVE IMPACTS).

DISPLACEMENT OF WILDLIFE

Indirect effects of the project include displacement of wildlife from construction activities, increased potential for vehicle-related injuries to wildlife, and disturbance to wildlife from noise and lighting during operation. Displacement of wildlife, such as deer and lagomorphs, will be temporary during the construction period. Vehicular accidents can be reduced by enforced speed limits. Noise and lighting disturbance should not greatly exceed current levels at the site. Therefore, none of these impacts are expected to be significant.

TRANSMISSION LINE RECONDUCTORING

Reconductoring of the PG&E 230 kV line will require the removal of existing and installation of new conductors and insulators (TMP 1999h, Data Response #68). Ground crews and helicopters will visit each tower. Old and new insulators will be transported by helicopter. Old conductors will be pulled using the tension stringing method and will not be dragged along the ground or cause crushing or clearing of vegetation. New conductors will be pulled through the new insulators simultaneously. Pull and tension sites will be established every 2-4 miles. Equipment will include one truck-mounted Utah sprocket conductor puller, one or two trailer-mounted take-up spools to reel in old conductors, and various light trucks for workers and materials. Construction will occur from mid-August to December. A 2-5 mile section will require three or four days of work and the helicopter will hover no more than ten minutes above each tower.

PERMANENT AND TEMPORARY LOSS OF HABITAT

Twenty pull sites requiring 3 acres each (60 acres total) have been identified (TMP 1999b Table 3-1, Figures 1 – 121). Pull sites will be graded to provide cleared, flat terrain for pulling and tension vehicles. Habitat types that will be impacted by the pull sites are provided in **Biological Resources Table 5**. Crews will use existing access roads that are in good condition and no grading or other improvements are anticipated. Access to each pull site is identified in TMP 1999b (pages I-2-156 – I-2-165). Transmission towers will not be replaced but some may have to be raised to increase ground clearance. Raising towers will require a rubber-tired lifting crane to physically lift the entire tower so bolts and vertical extensions can be installed.

BIOLOGICAL RESOURCES Table 5
Habitats Impacted by the Pull Sites for Transmission Line Reconductoring

Habitat	Acres	Pull Site Numbers
Developed	6	1, 20
Blue Oak Woodland	6	2, 6
Annual Grassland	3	3
Annual Grassland, Blue Oak Woodland	6	4,5
Annual Grassland, Wet Meadow	3	17
Mixed Forest	12	7,8,9,10
Burned chaparral, Coniferous Forest	3	11
Coniferous Forest (3 sites burned)	15	12,13,14,18,19
Burned Coniferous Forest, Montane Chaparral	3	15
Ponderosa Pine Forest	3	16
Totals:	**60**	**20**

Reconnaissance level surveys conducted in April 1999 were too early to identify all occurrences of sensitive plant species, but did identify potential areas for occurrence (**Biological Resources Table 6**). Fourteen sensitive plant species were either present or have moderate to high potential to occur along the route (**Biological Resources, Table 2**). Two of these, Boggs Lake hedge-hyssop and slender orcutt grass are listed species that inhabit seasonal wetlands or vernal pool areas. Six sites have wetland, vernal pool, and/or marsh habitats. Therefore, follow-up surveys were conducted in May and June 2000 (Ganda and Associates 2000). No listed species were found, but new populations of CNPS List 1B species (Ahart's paronychia and Bellinger’s meadowfoam) were recorded. The applicant has stated that pull sites will be located to avoid sensitive areas and will be re-vegetated to prevent erosion.

DISPLACEMENT OF WILDLIFE

Thirty-eight sensitive wildlife species have a high or moderate potential to occur along the route (Biological Resources Table 3). Of these, six inhabit waterways (e.g. Shasta crayfish) and four are bats. Waterways and bat roost sites (e.g. caves, mines, bridges) will not be impacted by construction activities. Construction will occur during deer migration and hunting seasons. The presence of equipment, helicopters, and work crews will create disturbances that will deter wildlife from using the area under construction. Deer and other wildlife using the area will likely be temporarily displaced from the 2-5 mile segment under construction for a duration of 3-4 days. Deer are crepuscular and generally bedded-down during the daylight hours. Displacement of wildlife will be a temporary impact that is not considered significant.

NEST DISTURBANCE AND AVIAN COLLISION

Several raptors as well as ravens and magpies will use transmission line towers as nest sites. Others, such as the northern spotted owl (federally threatened) and other owl species, nest in tree cavities that may be difficult to detect but susceptible to disturbance from construction activities. Nesting territories and sometimes individual nest sites are often well established and reused for consecutive years. Bald eagle (federally threatened and state endangered), golden eagle, Cooper's hawk, red-tailed hawk, and osprey individuals and/or tower nest sites were observed. Northern spotted owl, goshawk, bank swallows, olive-side flycatcher, purple martin, and hermit warbler are known to be present in the area. Other raptors such as northern pygmy owl, northern saw-whet owl, flammulated owl, western screech owl, great-horned owl, sharp-shinned hawks, red-shouldered hawks, American kestrel, white-tailed kite, and northern harriers are undoubtedly present along the route. The nesting period for raptors varies by species, but generally extends from January to mid-August for all species. Disturbances at or near nest sites during the nesting season can lead to nest abandonment. Additionally, some existing tower nests will be removed or altered to accommodate reconductoring. TMP has developed a Raptor Management Plan and will not conduct any transmission line activities during the nesting season, January to August.

BIOLOGICAL RESOURCES Table 6
Results of Reconnaissance Surveys at or near Pull Sites

Pull Site	Location[1]	Species Present (P) or Potentially Present (x)
1	T29N R4W S1	Wetlands (P), Red Bluff dwarf rush (x),
2	T30N R3W S16	Vernal pools (P), osprey nest (P), bald eagle (P), golden eagle, Cooper's hawk (P), Red Bluff dwarf rush (P), Ahart's paronychia (x), silky cryptantha (x)
3	T31N R3W S34	Vernal pools (P), osprey (P), woolly meadowfoam (P), Red Bluff dwarf rush (x), Ahart's paronychia (x), silky cryptantha (x)
4	T31N R3W S13	Wetlands (P), woolly meadowfoam (P)
5	T32N R2W S32	Red Bluff dwarf rush (x), Ahart's paronychia (x), silky cryptantha (x)
6	T32N R2W S22	Wetlands (P), vernal pools (P)
7	T33N R2W S36	Marsh (P), Butte fritillary (x)
8	T33N R1W S17	Butte fritillary (x)
9	T34N R1W S33	None found
10	T34N R1W S23	Butte County morning glory (x), Stillman's needlegrass (x), Shasta jewel-flower (x), Macnab cypress forest (x).
11	T34N R1E S9	None found – burned
12	T34N R1E S1	None found – burned
13	T34N R2E S5	None found – burned
14	T35N R2E S28	None found – burned
15	T35N R2E S13	Wetlands (P), long-haired star tulip (x)
16	T35N R3E S4	Osprey nest (P)
17	T35N R2E S23	Meadow (P), wetlands (x), long-haired star tulip (x)
18	T35N R2E S3	None found – burned
19	T36N R2E S9	Bald eagle territory (P), spotted owl territory (P), goshawk (x), pine martin (x), fisher (x)
20	T36N R2E S9	Developed

[1]Latitude/Longitude provided in TMP 1999b, Table 3-1.

Bird mortality from collisions with the transmission lines is well documented and can be high for predatory raptors and migratory waterfowl (CEC 1995). Avian collisions with the existing lines have not been documented and a cursory survey under the line in spring 2000 did not find any dead birds (Ganda and Associates 2000). Given the distance of the line, potential waterfowl use in the southern area, and historic nesting territories of listed species, collision risk could be moderate. However, the line will not include a ground wire, which due to its position on lines and small gauge is generally most responsible for avian collisions. Therefore, collision risk is not expected to be high or result in significant impacts. Nonetheless, collision risk to listed species include the bald eagle and northern spotted owl. U.S. Fish and Wildlife service will require TMP to obtain Incidental Take Permits and to conduct a study to help determine the extent of avian collisions in bald eagle, spotted owl and waterfowl use areas. If bird fatalities in excess of permit requirements are documented and contributed to collisions with conductors, remedial actions such as the installation of bird flight diverters will be implemented (see Raptor Management Plan under BIO-9).

CUMULATIVE IMPACTS

The Burney Valley is a rural setting with few industrial developments and residential neighborhoods centered around Burney and Johnson Park. Other new developments planned for the area include a 300-acre, low density residential development west of the site and a 40-acre commercial project at the junction of Highway 299 and State Route 89.

The power plant site proper will be located on an industrial site. Wildlife use of the immediate vicinity surrounding the proposed power plant site is primarily deer, raptors, coyotes, and lagomorphs. The loss of approximately 19 acres of ponderosa pine habitat will not cause a significant cumulative impact. The existing transmission line crosses several habitats that support numerous sensitive species. Reconductoring activities will not result in new towers and, if avoidance measures are implemented, will not result in cumulative impacts.

Cumulative impacts from the proposed increase in consumptive use of the Burney aquifer are difficult to quantify. The aquifer relies solely on precipitation for recharge. Water resource staff assumes that the project impacts are proportional to the total volume of basin discharge (see Water Resources Table 14) . TMP water use would increase current consumptive use by 5%. During normal years, annual basin outflow of about 152,000 AFY is reduced 12% by consumptive use (about 20,000 AFY). During the summer months alone when basin outflow is only 35,000 AFY and consumptive use is highest (18,000 AFY), the outflow is reduced by 34%. TMP water use would only increase consumptive use by 3% (537/35,000 FY), but account for 15% of the total water supply. The 3% increase is not considered to be a significant change in water supply to springs and therefore not an adverse impact to the spring biota

Hydrological information from prior drought years indicates flows were reduced 75,000 AFY. The proportion of consumptive use of 20,000 AFY and 21,000 AFY would represent 26% and 28%, respectively, of the total volume of basin discharge. During the summer months alone when flows could be as low as 17,500 AFY, this ratio increases to 57%. While TMP's consumptive use alone would not represent a significant increase, it would adversely contribute to a significant situation of low groundwater supply, thereby exacerbating an already stressed ecosystem. It should be noted that the 75,000 AFY value was not derived from the worst drought on record (25-year drought), but from the only drought information available (6-year drought). Therefore, this scenario does not necessarily represent reasonable worst case

Although we can not predict when a drought will occur, it is entirely safe to assume one will occur during the 35-year life of the project. Since 1906, three droughts in northern California have been recorded and separated by a period of less than 35 years: 1913-1938, 1971-1977, and 1988-1994. While we can not predict the severity of the drought, information available from one of the shortest droughts on record shows substantial reduction (35 –100%) in spring flows. Data on springs monitored during that drought show large springs (82,000 to 105,000 AFY) experienced a 10% reduction in flow per year (Rose et al. 1995). Smaller springs (less than 1 cfs), which respond more quickly to reductions in groundwater supply, dried (Ellis 2000a, c). Therefore, existing conditions in the Burney watershed are significantly altered during prolonged drought conditions. Further reductions in groundwater by TMP water use during prolonged drought could accelerate or prolong periods of reduced or ceased flow in springs in the area. This impact is a potentially significant cumulative impact depending on the severity of the drought

The spring ecosystem is unique and represents one of the largest spring systems in the United States. Threats to this ecosystem alone could be significant. The springs support several aquatic species, many entirely dependent on the smaller flowing springs. Reductions in flow result in reductions in aquatic habitat, higher water temperatures, and increased siltation from the lack of filtration. Habitat requirements of the aquatic-dependent species are cool, clear springs, and many require cobblestone substrates with little or no siltation Therefore, reduction in spring flows would significantly threaten these species. Because these spring habitats are small and isolated, resulting in island populations that are at a higher risk of local extinction, the potential for significant impacts is elevated.

The springs that are known to be directly linked to the Burney basin aquifer support potential habitat for the highly endangered Shasta crayfish (It should be noted that surveys to confirm presence or absence were not conducted). USFWS consider these springs to be important for the long-term recovery of Shasta crayfish. Evidence indicates that there could be a hydrologic link between the Burney and Hat Creek aquifers and that Crystal Lake springs could also be threatened by additional consumptive use of groundwater. Crystal Lake supports one of the five remaining population centers of Shasta crayfish and one of the only remaining populations in the Hat Creek subdrainage. Threats to this spring would be a significant cumulative impact in that it has the potential fo adversely affect a state and federally listed species.

Springs with known direct connection to the Burney aquifer also support US Forest Service sensitive species, federal species of concern, and state species of special concern. While none of these species are listed as federally or state threatened or endangered, Appendix J of CEQA defines an impact to be significant if it has a substantial adverse effect, either directly or indirectly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations. Four of these species are Federal Species of Concern and five are U.S. Forest Service Sensitive. The Northwest Forest Plan and its Standards and Guidelines call for maintaining spatial and temporal connectivity within and between watersheds to provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species and to maintain in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats. Clearly, the potential for adverse modifications to the habitat of species declared sensitive by a federal policy is an issue in this case. Further, the range and status of many have not yet been described. Once that is known, many of these species could be listed due to their limited range and highly endemic nature.

MITIGATION

CONSTRUCTION ACITIVITIES

The applicant has worked with staff to develop mitigation measures to avoid or reduce impacts to biological resources from construction of the power plant and from reconductoring acitivites (TMP 1999a, Section 6.13.3; TMP 1999b Section 6.1, Appendix I, Section 4.1; Ganda and Associates 2000). The applicant has also developed a draft Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) that provides more detail for implementing mitigation measures (TMP 1999e; TMP 2000b). Staff and USFWS have reviewed the draft and provided comments to the applicant. A final BRMIMP will be provided for CEC and other agency review and approval prior to start of any construction activities (see **Biological Resources Condition BIO-4**). These general mitigation measures are provided below.

GENERAL MITIGATION MEASURES

PLANT SITE, GAS AND WATER PIPELINES, AND NEW TRANSMISSION LINE

- Locate laydown areas on disturbed sites and at least 100 feet away from sensitive resource areas
- Minimize construction corridor widths
- Mark and avoid sensitive resource areas
- Restrict traffic to designated roads
- Brief contractors on location of construction zone boundaries and other mitigation measures
- Control erosion and sedimentation
- Preserve and, within two weeks, replace six inches of topsoil in temporary construction areas
- Recontour in disturbed areas and re-seed with a grass mixture
- Inspect open trenches for entrapped wildlife each morning and before re-filling with soil
- Provide a qualified biologist to monitor construction activities
- Conduct compliance inspections once a week
- Provide annual compliance reports and a post construction report 45 days after the project is completed

TRANSMISSION LINE RECONDUCTORING ACTIVITIES

- Develop a Raptor Management Plan for reconductoring activities along the existing transmission line

- Design transmission lines to reduce risk of avian electrocution
- Conduct activities between mid-August and December to avoid the raptor nesting season
- Implement measures to reduce avian collisions in the event that the incidence of avian collision is considered unacceptable by USFWS.
- Preserve existing tower nests whenever feasible
- Conduct preconstruction surveys at pull sites and delineate avoidance and buffer zones around sensitive plant populations and wetland habitats.
- Travel only on existing access roads. Prohibit vehicles from entering any stream, river, or creek bed.
- Prohibit addition or removal of any dredge material to or from wetlands
- Restrict pull site locations to disturbed areas, chaparral or grassland habitats under the existing transmission line corridor. Avoid wetlands and other sensitive resource areas
- Provide a biological monitor knowledgeable in botany and raptor biology during all times of construction activities
- Treat the pull site locations with soil stabilizers and reseed with native forbs and grasses.

OPERATION

The operation of the power plant during the drought periods will contribute to reduced spring flow and greater environmental stress on both the Shasta Crayfish and aquatic/terrestrial mollusks. This reduction in spring flow constitutes a potential significant cumulative impact that requires mitigation. Staff has considered a range of mitigation, including dry cooling, the purchase of water use “off-sets” from agricultural uses, and research and protective projects to assist the recovery and protection of both the crayfish and the mollusks.

During negotiations with CURE and the State Department of Parks and Recreation, the applicant agreed to substantially reduced water use. Although this reduction in water use through a hybrid wet/dry cooling is commendable and greatly reduces impacts, the new pumping is still a potential significant cumulative impact requiring further mitigation.

In Staff’s view, the proportionate and appropriate mitigation for these potential impacts, considering the uncertainties associated with them, are measures that contribute to the long-term scientific understanding and potential recovery of these species. The long and short-term benefits from the information gained by these studies are seemingly proportionate to the potential cumulative impacts from the project’s use of groundwater.

SHASTA CRAYFISH MITIGATION

Recovery Task 3.1 of the Shasta Crayfish Recovery Plan (USFWS 1998) is to design and conduct flume studies to develop and test crayfish barrier designs (USFWS 1998). The purpose of the study is to create effective barriers to the upstream migration of signal crayfish, the highly invasive, non-native crayfish that poses the single largest threat to the continued existence of the Shasta crayfish. Barriers need to be tested under different velocity regimes, including no flow, and to determine impacts of sediment transport and vegetation on the effectiveness of the barrier. Implementation of four other priority one recovery tasks that call for the installation of barriers depend on the outcome of this study. TMP has agreed to provide up to $250,000 to fund this study to compensate for TMPP's consumptive use of the regional groundwater. The study would be conducted by either the Desert Research Institute and Biological Research Center, a non-profit division of the University of Nevada or the Spring Rivers Ecological Sciences, pending approval by USFWS.

USFWS view the implementation of this barrier study, a priority one recovery task specified in the Shasta crayfish recovery plan (USFWS 1998), as critical for the recovery of Shasta crayfish. Surveys in the mid 1990's found the abundance of Shasta Crayfish at Crystal Lake alone decreased from 1978 numbers by an order of magnitude due to competition from signal crayfish (FERC 2000). Given the imminent threat to Shasta crayfish from signal crayfish, USFWS believes, and staff concurs, the potential long-term benefit to Shasta crayfish from designing and constructing a successful signal crayfish barriers could be an increase population levels. Increasing the numbers of Shasta crayfish could help stabilize the population to levels that could better withstand adverse random events such as drought. Staff contends, however, that the amount of compensation funds proposed by the applicant are not sufficient to complete this barrier study. TMP has proposed to fund up to $250,000. After discussions with the principal investigator at the Desert Research Institute and Spring Rivers Ecological Sciences , it is apparent that this sum may be enough to design and conduct laboratory tests of the effectiveness of some barriers, but that several types of barriers would need to be designed to meet the needs of various conditions (velocities, sedimentation, vegetation, etc) and that the cost of constructing field prototypes for testing would likely equal that of the cost of design and lab-testing (D. Sada, pers comm. 2000). In order for this compensation study to be an effective mitigation measure, it is imperative that it be funded to completion. Therefore, staff recommends that the Commission require TMP to fund up to $500,000 to complete this study, as this sum appears to be necessary for design, lab-testing, and construction of prototypes (D. Sada, pers comm 2000). Funds not used will be reimbursed.

AQUATIC AND TERRESTRIAL MOLLUSK STUDY

Little is known about the abundance or distribution of the aquatic and terrestrial mollusks endemic to the local intermountain area (Ellis 1999b). Some of the species are not taxonomically described beyond their genera. The habitat requirements for some are not known or not fully understood. Once this information is known, it is plausible that many will be proposed for federal and/or state listing. Without such status, protection under federal or state laws is limited. Yet due to the insular nature, and therefore vulnerability, of their populations, protection may be warranted once more information is available. In order to mitigate the project's contribution to cumulative effects of water use, staff proposes TMP provide funds to initiate a study to determine abundance, distribution, and habitat requirements of these mollusks. Staff believes that this study would provide the information necessary to better understand the life history requirements for many species that are not currently protected, yet may require protection, and would greatly contribute to our scientific knowledge. This information could help determine the need for listing.

FACILITY CLOSURE

PERMANENT FACILITY CLOSURE

The anticipated life expectancy of power plants is 30 years. Planned or unexpected closure must adhere to measures that ensure no significant impacts to biological resources. The applicant must develop an on-site contingency plan to address facility closure and include this plan in the BRMIMP. The proposed power plant will be built on a site that is currently disturbed. The linear pipelines will be re-vegetated, and impacts associated with their construction are temporary. The existing transmission line will service projects in addition to the TMPP. Therefore, a contingency plan need only address hazardous materials and decommissioning of the new transmission line.

TEMPORARY FACILITY CLOSURE

No impacts to biological resources should occur in the event of temporary facility closure. Therefore, no mitigation measures are required.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

TMP has redesigned the project to reduce consumptive groundwater use from 2,900 AFY to 1000 AFY and has eliminated the need for percolation ponds that could have contributed toxic levels of metals into the aquifer. These measures considerably reduced the level of impact that would have been caused by the project. However, the effects of pumping 900 AFY of groundwater, most of which will occur during the dry season when no recharge is occurring, would negatively contribute to adverse reductions in spring flows and species dependent upon these springs, during periods of prolonged drought. The extent of this cumulative impact depends on the severity of the drought.

The occurrence of drought in this area is relatively frequent and it is highly probable that one will occur during the 35-year life of the project. The water delivery agreement between Burney Water District and TMP gives the District the right to restrict or prohibit water delivery during an emergency caused by drought or other conditions which result in water shortages (Burney Water District 2000). However, the District does not take impacts to aquatic biota under consideration when determining what constitutes an emergency (Suppa 2000, pers comm.). Therefore, there are no safeguards in place to protect biological resources.

Staff has worked closely with USFWS to assess the impacts and determine appropriate mitigation. It is our conclusion that the long-term benefits to the Shasta crayfish from implementing a signal crayfish barrier design and constructing prototype barriers found to be effective will mitigate potential impacts to the Shasta crayfish from TMP operation.
Potential impacts from the increase in the consumptive use of groundwater from TMP to the terrestrial and aquatic mollusks during drought are not quantifiable More information is needed about the species affected and the degree of impact from drought conditions. However, due to the lack of information needed to accurate assess impacts from this or any other project, staff has proposed a study to help gain that information. It is believed that this study will provide short- and long-term benefits to these species by providing the basic information needed to describe, possibly list, and protect these species.

The reconductoring activities have the potential to impact wetland habitats, raptors and waterfowl. Mitigation measures proposed by the applicant and staff to conduct botanical surveys at the appropriate time of year, document current levels of avian mortality, create avoidance zones around sensitive areas, and reseed areas graded for pull sites would reduce these to less than significant.

COMPLIANCE WITH LORS

The applicant intends to avoid all sensitive wildlife, plant, and wetland, and riparian areas. However, the potential for impacts to the federally listed Shasta crayfish and collision of listed birds with the powerlines require the applicant to consult with and acquire Incidental Take Permits from U.S. Fish and Wildlife. A biological opinion from USFWS should be issued by January 2001. Staff will request the applicant to obtain a letter from this California Department of Fish and Game stating that Streambed Alteration and Incidental Take permits are not required. Because portions of the reconductoring activity will occur on federal Forest Service lands, staff will also require the applicant to obtain letters from Shasta National Forest stating their approval.

CONDITIONS OF CERTIFICATION

DESIGNATED BIOLOGIST

BIO-1 Site modifications including ancillary facilities preparation shall not begin until an Energy Commission CPM approved Designated Biologist is available to be on site.

Protocol: The Designated Biologist must meet the following minimum qualifications:

1. a Bachelor's Degree in biological sciences, zoology, botany, ecology, or a closely related field;

2. three years of experience in field biology;
3. one year of field experience with biological resources found in or near the project area including the plant and raptor species and wetlands; and
4. an ability to demonstrate to the satisfaction of the CPM the appropriate education and experience for the biological resources tasks that must be addressed during project construction and operation.

If the CPM determines the proposed Designated Biologist to be unacceptable, the project owner shall submit another individual's name and qualifications for consideration. If the approved Designated Biologist needs to be replaced, the project owner shall obtain approval of a new Designated Biologist by submitting to the CPM the name, qualifications, address, and telephone number of the proposed replacement. No disturbance will be allowed in any designated sensitive areas until the CPM approves a new Designated Biologist and the new biologist is on site.

Verification: At least 60 days prior to the start of any site mobilization activities, the project owner shall submit to the CPM for approval, the name, qualifications, address and telephone number of the individual selected by the project owner as the Designated Biologist. If a Designated Biologist is replaced, the information on the proposed replacement, as specified in the condition, must be submitted in writing at least ten working days prior to the termination or release of the preceding Designated Biologist.

BIO-2 The CPM approved Designated Biologist shall perform the following during project construction and operation:

1. advise the project owner's Construction Manager on the implementation of the Biological Resource Conditions of Certification;
2. supervise or conduct surveys, mitigation, daily monitoring and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as, wetlands and special status species;
3. prohibit workers and vehicles from entering or disturbing designated sensitive areas or creeks, rivers, and streams; and
4. notify the project owner and the CPM of any non-compliance with any Biological Resources Condition of Certification.

Verification: During project construction, the Designated Biologist shall maintain written records of the tasks described above, and summaries of these records shall be submitted along with the Monthly Compliance Reports to the CPM. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report.

BIO-3 The project owner's Construction Manager shall act on the advice of the Designated Biologist to ensure conformance with the Biological Resources Conditions of Certification.

Protocol: The project owner's Construction Manager shall halt, if necessary, all construction activities in areas specifically identified by the Designated Biologist as sensitive to assure that potential significant biological resource impacts are avoided.

The Designated Biologist shall:

1. inform the project owner and the Construction Manager when to resume construction, and
2. advise the CPM if any corrective actions are needed or have been instituted.

Verification: Within two (2) working days of a Designated Biologist notification of non-compliance with a Biological Resources condition of certification or a halt of construction, the project owner shall notify the CPM by telephone of the circumstances and actions being taken to resolve the problem or the non-compliance with a condition. For any necessary corrective action taken by the project owner, a determination of success or failure will be made by the CPM within five (5) working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION & MONITORING PLAN

BIO-4 The project owner shall submit to the CPM for review and approval a copy of the final Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) and, once approved, shall implement the measures identified in the plan.

Protocol: The final BRMIMP shall identify:

1. all Biological Resource Conditions included in the Commission's Final Decision;
2. protocols for conducting botanical, dead bird, and raptor nest surveys along the existing transmission line;
3. provisions for mitigating avian collision, if applicable;
4. a list of all terms and conditions of USFWS biological opinion and any CDFG or USFS requirements or recommendations;
5. a detailed description of measures, Best Management Practices, and take avoidance measures that will be implemented to avoid and/or minimize impacts to sensitive species and reduce habitat disturbance;
6. all locations, on a map of suitable scale, of laydown areas and areas requiring temporary protection and avoidance during construction;
7. aerial photographs (scale 1:200) of all pull sites- one set prior to site disturbance and one set after project construction- showing locations of sensitive areas. Include planned timing of aerial photography and a description of why times were chosen;
8. a raptor management plan and re-vegetation plan;

9. duration for each type of monitoring and a description of monitoring methodologies and frequency;
10. performance standards to be used to help decide if/when proposed mitigation is or is not successful;
11. all performance standards and remedial measures to be implemented if performance standards are not met;
12. a discussion of biological resource-related facility closure measures; and;
13. a process for proposing plan modifications to the CPM and appropriate agencies for review and approval.

Verification: At least 45 days prior to start of site mobilization activities, the project owner shall provide the CPM with the final version of the BRMIMP for this project, and the CPM will determine acceptability of the plan. The project owner shall notify the CPM five (5) working days before implementing any CPM approved modifications to the BRMIMP.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval, a written report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which mitigation and monitoring plan items are still outstanding.

WORKER ENVIRONMENTAL AWARENESS PROGRAM

BIO-5 The project owner shall develop and implement a CPM approved Worker Environmental Awareness Program in which each of its employees, as well as employees of contractors and subcontractors who work on the project site or related facilities during construction and operation, are informed about sensitive biological resources associated with the project.

Protocol: The Worker Environmental Awareness Program must:

1. be developed by the Designated Biologist and consist of an on-site or training center presentation in which supporting written material is made available to all participants;
2. discuss the locations and types of sensitive biological resources on the project site and adjacent areas;
3. present the reasons for protecting these resources;
4. present the meaning of various temporary and permanent habitat protection measures; and
5. identify whom to contact if there are further comments and questions about the material discussed in the program.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist.

Each participant in the on-site Worker Environmental Awareness Program shall sign a statement declaring that the individual understands and shall abide by the guidelines set forth in the program materials. The person administering the program shall also sign each statement.

Verification: At least 60 days prior to the start of site mobilization, the project owner shall provide copies of the Worker Environmental Awareness Program, all supporting materials, and the name and qualifications of the person(s) administering the program to the CPM for approval. The project owner shall state in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date. The signed statements for the construction phase shall be kept on file by the project owner and made available for examination by the CPM for a period of at least six (6) months after the start of commercial operation. During project operation, signed statements for active project operational personnel shall be kept on file for the duration of their employment and for six (6) months after their termination.

AGENCY COMPLIANCE

BIO-6 Prior to start of any site mobilization activities, the project owner shall acquire Incidental Take Permits from U.S. Fish and Wildlife Service and a letter from California Department of Fish that permits are not required from that agency for the construction and operation of the Three Mountain Power Project and implement any terms and conditions of those agencies.

Verification: No less than ninety (90) days prior to the start of any site mobilization activities, the project owner shall submit to the CPM a copy of the final Incidental Take Permit from USFWS and a letter from CDFG, stating that permits from that agency are not required for this project. Any terms and conditions stated in the permit and letter shall be incorporated into the final Biological Resources Mitigation Implementation and Monitoring Plan.

BIO-7 Prior to start of any site mobilization activities, the project owner shall obtain a letter from Shasta National Forest stating their approval of construction activities that will occur on Forest Service lands and implement any terms and conditions.

Verification: No less than ninety (90) days prior to the start of any site mobilization activities, the project owner shall submit to the CPM copies of the letter from the Shasta National Forest and incorporate any terms and conditions into final Biological Resources Mitigation Implementation and Monitoring Plan.

PRECONSTRUCTION SURVEYS

BIO-8 Prior to start of any reconductoring activities, the project owner shall conduct surveys for sensitive plant species during the appropriate blooming period and concomitant surveys for dead birds and raptor nests along the existing transmission line corridor. Locations of sensitive plant populations and wetlands shall be delineated and avoided by construction activities.

Verification: No less than thirty (30) days prior to the start of any reconductoring activities, the project owner shall submit to the CPM a report of results from the plant, bird, and nest surveys. The report shall specify and map locations of sensitive resources and bird fatalities, and discuss avoidance measures and any necessary remedial actions.

GENERAL MITIGATION

BIO-9 The project owner shall implement the following mitigation measures and incorporate these into the BRMIMP.

PROJECT SITE

1. Minimize width of construction corridor to 50 feet for pipelines and 200 feet for the new transmission line corridor.
2. Design and locate staging areas and access/construction roads to disturbed areas whenever possible and at least 100 feet away from areas supporting sensitive species.
3. Construction area boundaries will be clearly delineated by flagging or fencing to minimize disturbance to natural habitat.
4. Control erosion and sedimentation by conducting construction activities during dry periods, and by using silt fences, sandbags, and detention basins.
5. Preserve and, within two weeks, replace topsoil from areas temporarily impacted. Replaced topsoil will be decompacted to a depth of 18 inches. Original grades will be restored with a minimum of 6 inches of topsoil.
6. Re-vegetate linear corridors with native seed mixtures.
7. Restrict traffic to established roads, designated access roads, construction areas, storage areas, staging areas or parking areas.
8. Inspect open trenches for wildlife prior to start of daily construction activities. Any wildlife observed will be allowed to escape on its own. If necessary, ramps and side exits will be placed in the trench every 0.25 mile.

TRANSMISSION LINE RECONDUCTORING

1. Prohibit the removal or addition of dredge material into any wetlands.
2. Prohibit vehicles from entering any stream, river, or creek bed.
3. Restrict pull site locations to disturbed areas, previously cleared areas such as chaparral or grassland habitats lacking vernal pools, wetlands, or sensitive plant populations.
4. Treat all pull sites with soil stabilizers and native seed treatments to reduce erosion
5. Conduct reconductoring activities only from mid-August through December to avoid the raptor nesting season.
6. Conduct a raptor and waterfowl collision study approved by USFWS.
7. Provide a biological monitor knowledgeable in raptor biology and botany during all times of construction activity.
8. Design transmission line to reduce collision and electrocution risk.
9. Preserve existing tower nests whenever feasible.

Verification: During project construction, the project owner shall provide monthly compliance reports stating activities completed, mitigation measures implemented, sensitive biological resources areas encountered, raptor nests removed, and any infractions by construction personnel. Within thirty days after completion of the project construction, the project owner shall submit a post-construction compliance report that describes the following details: dates that construction occurred; data concerning success in meeting project mitigation measures; known project effects on any sensitive species encountered during the construction phase; an assessment of the extent and severity of project impacts on all sensitive wildlife habitats; and other appropriate information.

SHASTA CRAYFISH STUDY

BIO-10 Following the certification of Three Mountain Power project, the project owner shall provide a proposal to conduct the Shasta Crayfish mitigation barrier study from the Desert Research Institute of the University of Nevada, Reno, and Spring Rivers Ecological Sciences, Cassel, California. The proposal shall include study design, implementation plan, reporting requirements, and a method for tracking funds spent.

An agreement will be developed between the California Energy Commission staff, U. S. Fish and Wildlife Service staff, and either Spring Rivers Ecological Sciences or the Desert Research Institute, in consultation with the California Department of Fish and Game staff clearly identifying an acceptable study design and implementation plan and a requirement for accounting of how the funds are spent. At the conclusion of the Shasta Crayfish Mitigation Barrier Study, any funds remaining from the $500,000 mitigation fund will be returned to Three Mountain Power, or the current project owner, as appropriate.

Verification: Within ten (10) days following certification, the project owner will provide copies of the Shasta crayfish mitigation barrier study proposals to the CPM for selection and approval in consultation with USFWS.

BIO-11 Following the certification of Three Mountain Power project, the project owner shall provide $500,000 to the researcher(s) approved by the CPM in consultation with USFWS to conduct the Shasta Crayfish Mitigation Barrier Study.

Verification: Within ten (10) days after CPM approves the proposal specified in BIO-10, the project owner will provide written verification and a copy of the payment certificate to the CPM and U.S. Fish and Wildlife Service that the $500,000 has been paid to the selected researcher(s). Within sixty (60) days after the completion of the Shasta Mitigation Barrier Study, the CPM will notify the project owner or Three Mountain Power, whichever is appropriate, of any reimbursements due from unspent funds.

AQUATIC AND TERRESTRIAL MOLLUSKS STUDY

BIO-12 . Following certification of the project, the project owner shall provide $100,000 to an account set up by the CPM to fund a study of abundance, distribution. and habitat requirements for the sensitive aquatic and terrestrial mollusks that reside in the Burney Basin area.

An study plan will be developed between the California Energy Commission staff, U. S. Fish and Wildlife Service staff, and species experts clearly identifying an acceptable study design, implementation plan, and a requirement for accounting of how the funds are spent. At the conclusion of the Study, a final report will be provided to Three Mountain Power, or the current project owner, as appropriate.

Verification: Within twenty (20) days after certification, the project owner will provide payment of $100,000 to an account set up by the CPM to specifically fund the mollusk study and. a copy of the payment certificate to the CPM. Within sixty (60) days after the completion of the study, the CPM will provide the project owner copies of the final report.

FACILITY CLOSURE

BIO-12 The project owner will incorporate into the planned permanent or unexpected permanent closure plan measures that address the local biological resources. The biological resource facility closure measures will also be incorporated into the TMPP project BRMIMP.

Protocol: The planned permanent or unexpected permanent closure plan will require the following biological resource-related mitigation measures:

1. removal of transmission conductors when they are no longer used and useful; and
2. measures to restore wildlife habitat to promote the re-establishment of native plant and wildlife species.
3. measures to remove all toxic and hazardous materials from the site.

Verification: At least 12 months (or a mutually agreed upon time) prior to the commencement of closure activities, the project owner shall address all biological resource-related issues associated with facility closure in a Biological Resources Element. The Biological Resources Element will be incorporated into the Facility Closure Plan, and include a complete discussion of the local biological resources and proposed facility closure mitigation measures.

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SOIL & WATER RESOURCES

Testimony of Richard Sapudar and Linda Bond

INTRODUCTION

The soil and water resources section evaluates the Three Mountain Power, Inc. (TMP) proposed Three Mountain Power Project (TMPP) with respect to soil erosion, sedimentation, water supply, and water quality. The purpose of this evaluation is to provide an independent analysis of TMP's proposal. Energy Commission staff's objective is to ensure that there will be no significant, unmitigated adverse impacts to soil and water resources during project construction, operation and closure, and that the project complies with all applicable laws, ordinances, regulations, and standards.

This section is organized into 9 subsections. The Introduction provides an overview of the purpose, a discussion of the organization of the testimony, and a list of the issues addressed in the testimony. The subsection on Setting describes the regional and local soil and water conditions that are relevant to the proposed project and that may be impacted by project construction, operation or closure. The subsection on Laws, Ordinances, Regulations and Standards (LORS) identifies the applicable LORS with respect to soil and water. The Analysis and Identification of Potential Adverse Impacts subsection contains an evaluation of TMP's analysis of project impacts and a discussion of the staff analyses offered as an alternative . Staff analyses contain an evaluation of both project-specific impacts and project contributions to cumulative impacts.

The subsection on Mitigation discusses the need for mitigation, the adequacy of TMP's proposed mitigation, and any additional mitigation recommended by the staff. The next subsection addresses issues specific to Facility Closure. Finally, Conclusions and Recommendations summarize the results of the staff's analysis of potential adverse impacts, of needed mitigation, and of compliance with LORS. This subsection concludes with the staff's proposed monitoring and mitigation measures with the inclusion of proposed Conditions of Certification. This evaluation of the project's impacts on water and soil resource specifically focuses on the following issues of concern:

- whether project construction or operation will lead to accelerated wind or water erosion and sedimentation;
- how the project's use of water affects groundwater supplies;
- whether project construction or operation will lead to degradation of surface or groundwater quality;
- whether the project will comply with all applicable laws, ordinances, regulations and standards; and
- whether the project will comply with stormwater drainage requirements both during construction and operation.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

FEDERAL CLEAN WATER ACT

The Clean Water Act (33 USC section 1257 et seq.) requires states to set standards to protect water quality. Point source discharges to surface water are regulated by this act through requirements set forth in a National Pollutant Discharge Elimination System (NPDES) Permit. Stormwater discharges during construction and operation of a facility also fall under this act and must be addressed through either a project specific or general NPDES permit. In California, the nine Regional Water Quality Control Boards (RWQCB) administer the requirements of the Clean Water Act.

STATE

The Porter-Cologne Water Quality Control Act of 1967, Water Code section 13000 et seq., requires the State Water Resources Control Board (SWRCB) and the nine regional RWQCBs to adopt water quality criteria to protect state waters. These criteria include the identification of beneficial uses, narrative and numerical water quality standards and implementation procedures. The criteria for the project area are contained in the Central Valley Region Water Quality Control Plan (Basin Plan1994). This plan sets numerical and narrative water quality standards controlling the discharge of wastes with elevated temperature to the state's waters.

Section 13552.6 of the Water Code specifically states that the use of potable domestic water for cooling towers, if suitable recycled water is available, is an unreasonable use of water. The availability of recycled water is based upon a number of criteria, which must be taken into account by the SWRCB. These criteria are that: the quality and quantity of the recycled water are suitable for the use; the cost is reasonable, the use is not detrimental to public health, will not impact downstream users or biological resources, and will not degrade water quality.

Section 13552.8 of the Water Code states that any public agency may require the use of recycled water in cooling towers if certain criteria are met. These criteria include that recycled water is available and meets the requirements set forth in section 13550; the use does not adversely affect any existing water right; and if there is public exposure to cooling tower mist using recycled water, appropriate mitigation or control is necessary.

The SWRCB has also adopted a number of policies that provide guidelines for water quality protection. The principle policy of the State Board which addresses the specific siting of energy facilities is the Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling (adopted by the Board on June 19, 1976 by Resolution 75-58). This policy states that use of fresh inland waters should only be used for powerplant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. This SWRCB policy recommends that power plant cooling water should, in order of priority come from wastewater being discharged to the ocean, ocean water, brackish water from natural sources or irrigation return flow, inland waste waters of low total dissolved solids, and other inland waters. This policy goes on to address cooling water discharge prohibitions. This project as currently designed does not require Waste Discharge Requirements (WDRs) because no wastewater will be discharged.

THE SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65)

The Safe Drinking Water and Toxic Enforcement Act of 1986, Health and Safety Code section 25249.5 et seq., prohibits the discharge or release of chemicals known to cause cancer or reproductive toxicity into drinking water sources.

LOCAL

SHASTA COUNTY GENERAL PLAN

The Shasta County General Plan (General Plan) Chapter 12.12 establishes minimum requirements and requires that a permit be obtained for grading, excavating and filling activities in order to:

1. Control erosion and sedimentation to prevent damage to off-site property and streams, watercourses, and aquatic habitat.
2. Avoid creation of unstable slopes or filled areas.
3. Prevent impairment or destruction of potential leach fields for sewage disposal systems.
4. Regulate de facto development caused by uncontrolled grading.
5. A “major project” grading permit will be required for this project.

SETTING

The proposed TMPP is located in Burney basin in northeastern Shasta County. For the purposes of this section of the FSA, Burney basin refers to the Burney watershed. Burney aquifer refers primarily to saturated groundwater conditions that exist in the valley portions of the watershed.

REGIONAL

The climate of Burney basin is characteristic of the northern Sacramento Valley, with dry, hot summers and wet, cool winters. Rainfall occurs mainly between October and April. The average annual precipitation, measured at the city of Burney, is approximately 27.7 inches, with an annual snowfall of 38.4 inches. The average annual temperature in the basin is 40-degrees Fahrenheit, and ranges between an average monthly low temperature of 30-degrees Fahrenheit to an average monthly high temperature of 65-degrees Fahrenheit. The daily temperatures average from over 100-degrees Fahrenheit in the summer to below zero in the winter (TMPP 1999a, Appendix J). Rainfall and snowmelt are the primary source of recharge to the region's groundwater and surface water resources.

WATER RESOURCES

The Burney basin is located between the Modoc Plateau and Cascade mountain range. A string of volcanoes extending from Lassen Peak to the south of Burney basin, northward to the California-Oregon border and up into Washington state, is characteristic of the Cascade geologic province.

Burney basin was formed by successive volcanic (basalt) flows, which are now partially covered by a thin veneer of soil. The topography of the basin is varied, ranging from a broad expanse of level land, which is described as a large mountain meadow, and steep mountain slopes, primarily in the south and west (Soil & Water Figure 1). Thin soils have developed from the erosion of surrounding highlands and mountains and are deposited on the valley floor of the basin. Typical of uneroded volcanic terrain, there are a number of enclosed topographic drainages in the eastern portion of the basin. In addition, the topographic divide between Burney basin and the Hat Creek basin is low and poorly defined. The regional aquifer is comprised of an irregular system of fractures within the volcanic substrate, which stores and transmits the region's groundwater resources. It is presumed that the fracture system is connected within the valley and that the groundwater system between small topographic enclosures is connected. Large volume springs, notably Burney Falls, emerge from the terminus of the basalt flows, which are located at the north and northeastern end of the basin.

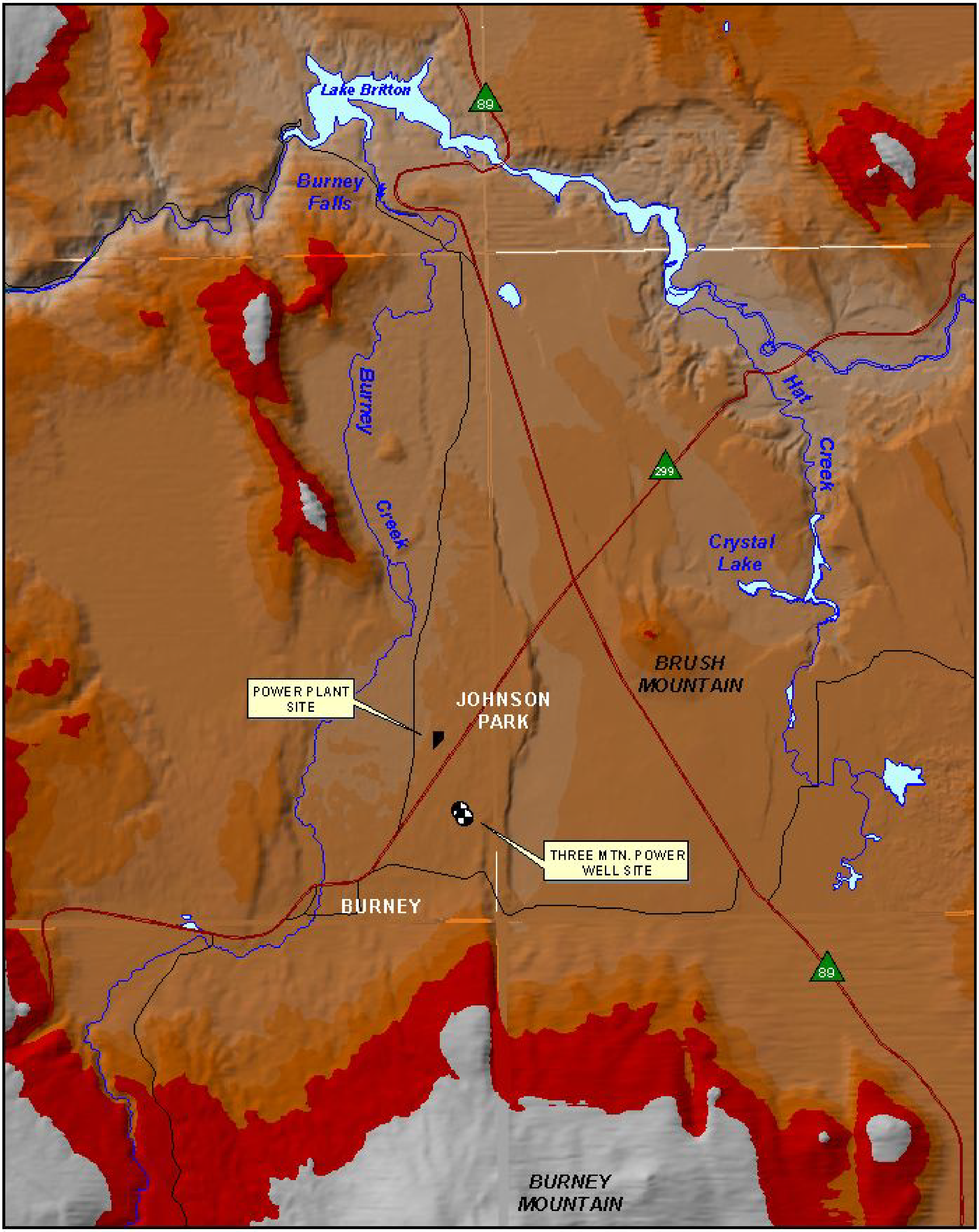
Geologic units present in Burney basin include young (Pleistocene) volcanic flows, older (Plio-Pleistocene) volcanic units occur in the western and southwestern parts of the basin, younger (Pleistocene to recent) units occurring in the central, northern, and northwestern parts of the basin. These younger units are underlain with an older (Pliocene) low-permeability sedimentary unit. There are also north-trending normal faults that bound tilted faults in the basin in which sediments are deposited (TMPP 1999a). The young volcanic flows, which cover most of the valley, comprise the primary water-bearing unit for the basin, called the Burney aquifer in this section of the FSA.

The Burney aquifer is approximately 500 feet thick at the south end of the valley near the city of Burney, based on DWR well logs. The aquifer thins to 200 to 300 feet at the north end of the basin and abruptly terminates. Lake Britton borders the aquifers northern extent and Hat Creek borders its northeast extent. Depth to groundwater ranges from about from 235 feet at the Burney Water District well field at the southern end of the valley to land surface at Burney Falls at the northern end of the valley. Wells also become progressively more shallow to the north as the aquifer thins and groundwater levels are closer to the land surface. (Lawrence and Associates, April 1999)

The connectivity of the aquifer system in Burney basin is determined by the nature of the rock fractures. Like most lava flows, the Burney aquifer system is not uniformly fractured. Volcanic rock is formed when rock is heated and melted deep below the land’s surface and is ejected from volcanoes or fissures as a liquid. As the liquid rock recrystalizes into solid rock, fractures form throughout the rock as it

SOILS & WATER - Figure 1

Three Mountain Energy Project - Topography of the Burney Basin Area



CALIFORNIA ENERGY COMMISSION, ENERGY FACILITIES SITING & ENVIRONMENTAL PROTECTION DIVISION, NOVEMBER 2000

SOURCE: USGS 7.5 Minute Digital Elevation Models, ESRI Arcdata cools. Furthermore, the quicker the rock cools, the more fractures occur. In addition to cooling fractures and lava tubes, faulting has occurred in Burney basin, resulting in a second system of fractures, which have created directional pathways for groundwater flow. The primary orientation of faults is north-south. The aquifer is “better connected” and most productive where rocks are highly fractured along faults and at the head and toe of individual lava flows, where cooling occurred rapidly. In addition, lava tubes, formed when air is trapped within the cooling basalt, can also transmit large quantities of water if the air pockets are connected by fractures. Lava tubes are known to occur in the vicinity of Burney.

Specific capacity tests in regional wells indicate that the Burney aquifer is highly permeable in many cases. For example, Burney Water District (BWD) reports that Well 7 produces 1740 gallons per minute with 2 feet of drawdown, which is equal to a specific capacity of 870 gallons per minute per foot (gpm/ft) (Source Water Assessment, 1999). However, the yield of wells does vary significantly in the wells across the basin. Other large wells in the Burney area report specific capacities that range from 5 gpm/ft to 1,867 gpm/ft (Soil & Water Table 1). As described above, high permeability is not intrinsic to these rocks themselves, but to the fractures along surfaces of lava flows, through cooling fractures, lava tubes and faults. This variability in yield is quite typical of wells in fractured rock aquifers because productivity depends on whether a well intercepts zones of higher fracturing or not. Within more fractured portions of the basalt flow, wells will be highly productive. Hydraulic conductivity, another measure of the permeability of an aquifer, can locally range from 0.1 foot per day to 10,000 feet per day in a permeable basalt aquifer (Freeze and Cherry, 1979), with average, regional values in the middle of this range.

SOIL & WATER TABLE 1
Production Rate, Drawdown
and Specific Capacity of Wells in Burney Basin
(Source: California Department of Water Resources Well Logs, compiled by Lawrence and Associates, April 1999)

Production Rate (gallons per minute)	Drawdown (feet)	Specific Capacity (gallons per minute/foot)
1,040	30	35
1,040	5	208
1,050	192	5
1,400	0.75	1,867
2,500	37	68
3,290	9	366
3,700	2	1,850
4,300	3	1,433

Note: Specific capacity equals the production rate divided by the drawdown.

Typically, fractured-rock aquifers have very low storage capacity, in comparison to sedimentary aquifer systems. Specific yield, a measure of storage capacity, can range from 5 to 50 percent, depending on the nature of the aquifer (Freeze and Cherry, 1979). The amount of water that can be stored in an aquifer system depends on the amount of space between the aquifer materials. In sedimentary aquifers, water can be stored between each grain of sand. In a fractured-rock system, the water can only be stored in the space between the cracks. The rapid decline in groundwater levels and spring flows during drought periods observed in the Burney area indicates that, on the whole, the percent of space in the fractures is low as compared to the solid rock, the aquifer drains quickly, and the quantity of stored groundwater is limited.

Burney basin also contains many small, high elevation springs that occur above the water table. These result from the capture of snowmelt and rainfall runoff, which infiltrates the shallow fractures at the surface of the basalt flow, travels down gradient along the fractures, and discharges where the fracture terminate at land surface. The main surface stream in Burney basin is Burney Creek, which is initiated by one of these surface-springs, south of the town of Burney.

Overlying the primary aquifer in Burney basin are limited areas of recent, low-permeability lake deposits. One such area maintains Burney Creek as a surface flow, north of the city of Burney. These young lake deposits slow the infiltration of surface water and the transmission of water to the aquifer and support the surface water flow. Beyond the lake deposits, north of Burney, Burney Creek disappears into the aquifer during dry times and re-emerges just upstream of Burney Falls. These recent lake deposits overlying the aquifer do not provide containment of the aquifer because the lake deposits are relatively thin and lie above the water table.

The older volcanic rocks in the west and northwest portion of the basin are less fractured and less permeable than the younger volcanic rocks that form the Burney aquifer. These older rock serve in part to contain western flow from the Burney aquifer.

The older sedimentary deposits that underlie the primary aquifer form a base to the aquifer system. Groundwater discharges from the aquifer at the interface between the volcanic rocks and the older sedimentary unit along the north and northeast boundary of the basin, producing many of the region's springs.

Based on the geology of the region, the nature of fractured-rock aquifer systems, and reported drawdown, staff concludes that the aquifer system of Burney basin is regionally unconfined. In an unconfined aquifer, drawdown from pumping causes the aquifer to dewater within the radius of influence. Drawdown in an unconfined aquifer tends to be smaller than the drawdown in a confined aquifer that is otherwise similar. High yields in Burney wells, coupled with the small drawdown, are an indicator of unconfined aquifer conditions.

However, evidence of locally confined conditions in the Burney aquifer was reported by Fox (2000) during her investigation. A confined aquifer requires an extensive layer of overlying low-permeability material within the saturated portion of the aquifer, which confines the groundwater under pressure. Springs emanating from a confined aquifer could travel upward from the source of confinement to discharge at the land surface. Staff agrees that it is likely that there are locally confined conditions in certain areas of the Burney aquifer.

Precipitation is the primary source of recharge to the Burney aquifer. Most of precipitation that is not consumed by native vegetation percolates to recharge the aquifer. A small percent (1 to 5 percent) is consumed as snow sublimation. Given the rocky, thin soils, little water is retained as soil moisture. California conifers, including those found in the Burney area, have a unique physiology that allow them to tolerate very low soil moisture, an adaptation to California's summer season of drought (Northup, 2000). The Burney aquifer may also be recharged by groundwater underflow from the Hat Creek basin (Rose, 1995, 2000a). Based on research conducted during the 1988-1992 drought, Rose has concluded from isotopic evidence that inflow from the Hat Creek area contributes to the discharge from Burney Falls and Salmon Springs as well as to groundwater flow in the northern part of Burney aquifer.

Groundwater discharges (outflows and consumption) from the Burney basin include, in order of magnitude, consumption by native vegetation, discharges from springs, surface water flows, and groundwater pumped consumed by agricultural, industrial and municipal users. Burney Falls comprises the major spring discharge for the basin with numerous small springs contributing to the discharge total. Other small springs form creeks that pond or flow into Hat Creek or Lake Britton. Springs in the north and northeastern portion of the basin discharge from the aquifer, which terminates at this end of the valley.

The direction of regional groundwater flow in the Burney aquifer is from the southern uplands, northward to Burney Falls, as described above. Based on groundwater levels collected by Fox and the Burney Resource Group (May and June 2000) (Soil & Water Figure 2) and by TMP, groundwater levels decline very gradually from the city of Burney for about 8 miles. The total change in groundwater levels over the 8 miles is 30 feet. Groundwater levels then sharply decline by about 95-feet over a distance of about two miles to the Burney Falls spring line. This break in the regional groundwater gradient is cause by the termination of the aquifer and the discharge of groundwater at Burney Falls. This kind of interface and discharge is called a seepage face and causes a change in the physical hydrodynamics of the flow of water as it exits the aquifer.

Burney Creek is the only major surface water flows in the basin. Burney Creek joins Burney Falls at the north end of the valley, which is located approximately 8 miles northeast of the city of Burney off Highway 89. At the base of the falls, Burney Creek and the discharged regional groundwater flow combine and continue as a surface water stream, which then flows about 2 miles before reaching Lake Britton on the Pit River.

Although there is agreement regarding the general nature and parameters of the water resources and the aquifer of Burney basin, the available data has significant limitations. Specifically, there is uncertainty about the flow paths within the aquifer and about the response of the aquifer and springs to drought. This information is

Insert Soil & Water Figure 2

needed to quantify with certainty how the groundwater system will respond to the proposed project.

The proposed TMPP is located in northeastern Shasta County, approximately one-mile northeast of the community of Burney. The proposed project site will occupy a 10.2 acre portion located in the southern corner of the 40 acre parcel occupied by the existing 10 MW biomass-fired Burney Mountain Power plant (BMP). The existing project uses approximately 300 acre-feet of groundwater per year, supplied by a well located on the site. The electrical substation will occupy an additional 200-foot by 500-foot parcel located to the northeast of the TMPP site. There are no surface water bodies in the immediate vicinity of the project site. Elevations at the 40-acre site average from 3,145 feet MSL at its southern corner to 3,120 feet at the northwestern corner. The project will be located on a flat portion of the site at an elevation of 3,140 feet above MSL. This location has already been graded and leveled, and should require only minor grading for the project. The predominate soil type found at the site is the Burney loam/clay loam, which is a moderately deep to deep well drained brown to reddish brown soil. This soils type has moderate permeability, with a low shrink-swell potential, and is only slightly susceptible to erosion (TMPP 1999a).

The 2,600 foot long route traversed by the new transmission lines will be west along the northern property line and north parallel to the existing railroad right-of-way, and will be constructed by PG&E according to standard design and construction practices. The route is relatively flat and undeveloped with some pine trees present, and soils expected to be similar to those on the site and in the basin. The interconnection of the new power plant to the PG&E system will require the construction of a new 230 kV substation in the northeast corner of the site, the looping of additional power lines into the new substation, and the reconductoring of the Pit #1 Cottonwood 230 kV transmission line, the Pit 1-Pit 3 230kV line, and the Pit 1-Round Mountain 230 kV line. In addition, the project will require the replacement of existing breakers and switches, and upgrading the protection of the PG&E system.

Vegetation at the site is sparse, although some areas have non-native and weedy species present, growing on soils derived from undifferentiated basaltic lava flows.

The principal supplier of water for domestic use in the project area is the BWD, with 1,698 connections and 411 million gallons produced in 1997 from three wells (DHS, 1999). These wells range in depth from 297 feet to 332 feet below ground surface with an average static water level of about 236 feet (TMPP 1999a).

ANALYSIS AND IDENTIFICATION OF POTENTIAL ADVERSE IMPACTS

In this section, staff assesses the potential for significant adverse impacts related to (1) erosion and sedimentation, (2) water resources, (3) wastewater, and (4) drainage water quality impacts.

CRITERIA FOR DETERMINING IMPACT SIGNIFICANCE

Accelerated water and/or wind induced erosion can degrade water quality and lessen habitat values. Discharge of contaminated stormwater runoff can similarily adversely affect water and biological resources. Staff considers discharge off-site of sediment or contaminated stormwater runoff to be a significant impact.

Establishing criteria for assessing the significance of impacts to water resources has been difficult in the Three Mountain case. The Burney aquifer is the sole source of water for both humans and the environment. The aquifer is currently a very clean and productive system. Minimal soil cover makes the aquifer more vulnerable to contamination, low storage capacity makes the aquifer more susceptible to groundwater declines during droughts . The many springs associated with the aquifer are equally responsive to groundwater changes. According to staff biologists, endangered and sensitive species are regionally dependent on flows from these springs.

However, information necessary to quantify with certainty the project's impacts on the aquifer is not available, as only limited data collection about the aquifer has been conducted. There is very limited data on the structure, properties and flow paths within the aquifer, on long-term trends in flows from springs and groundwater levels, and on the response of the aquifer and springs to changes in groundwater recharge and consumption.

As a result, staff's assessment of the project's impacts on water resources consists of a qualitative identification of impacts that are likely to occur as a result of the project. These effects include increased costs to other groundwater users due to drawdown, and changes in regional water levels that would curtail the survival of dependent biota.

PROJECT SPECIFIC IMPACTS

EROSION AND SEDIMENTATION

Activities associated with facility construction include grading, and other earth moving activities. Removal of protective cover vegetation and disturbance of the soil surface structure leaves the soil particles vulnerable to detachment by rainfall. Grading activities may result in soil compaction, which increases stormwater runoff velocities, allowing more soil particles to be entrained in the runoff and carried off-site. Alteration of natural drainages may cause runoff to cross-exposed surfaces leading to increased erosion. Sediment carried off-site is deposited in adjacent water bodies. This may reduce drainage capacity leading to flooding or degrade sensitive biological habitats. Erosion is also a significant concern where construction of linear facilities crosses natural and man-made drainages.

As discussed above, all of the soils affected by project elements have a slight water erosion hazard. When all vegetation is removed, the soils affected by the project should be considered highly vulnerable to erosion. Dewatering activities associated with power plant and gas line construction may also lead to erosion. Exposed berms and spoil piles are especially vulnerable to water erosion.

Typically, impacts caused by erosion can be fully mitigated through implementation of appropriate control measures. In this case, TMP proposes to use the standard erosion control measures identified in the Draft Erosion Control and Storm Management Plan to minimize soil erosion during and after construction(Bibbs 1999).During construction, these measures will include road and mountainous areas stabilized with gravel filler and filter fabric fencing (silt fencing), straw bales, compacted access road surfaces, and check dams. Construction stockpile materials will have filter fencing placed downslope. After final grading, exposed surfaces will be sealed or covered with an impermeable surface. Wind erosion and dust will be suppressed by watering of construction areas, soil stabilizers, mechanical sweeping, hydro-seeding, speed limits, revegetation, along with limiting activity when winds exceed 25 mph.

During project operation, wind and water action can continue to erode unprotected surfaces. An increase in the amount of impervious surfaces will increase runoff, leading to the erosion of unprotected surfaces. TMP has provided a draft Erosion Control and Stormwater Management Plan (Bibbs 1999) that identifies temporary and permanent erosion control measures at the site itself.

A natural gas pipeline is expected to extend from the site boundary in a northeastern direction, and directly south to the boundary of Carlton Enterprise, where it crosses State Route 299 in an easterly direction. It will follow a well-maintained dirt road on the east side of route SR 299 in a southeasterly direction to connect with an existing pipeline north of the pumping station. The total length of this proposed alternative is approximately 4000 feet.

In order to construct the natural gas pipeline, an undetermined amount of timberland will have to be cleared to the south, between the site and Carlton Enterprises. The remainder of the pipeline will be within areas that have previously been cleared for road easements or other purposes. The new areas will have to remain clear of vegetation to maintain a 10-foot buffer from the pipeline centerline.

PG& E will be constructing the natural gas line for the proposed project. The total area disturbed during gas pipeline construction is expected to exceed five acres. PG& E will prepare and implement a stormwater pollution prevention plan as required under the General Construction Activity Stormwater Permit issued by the State Water Resources Control Board. TMP has provided a separate draft storm water and erosion management plan for the construction of the linear facilities, including the natural gas pipelines and transmission lines discussed above, and the water supply pipelines discussed below, all of which are associated with the project.

WATER RESOURCES

PLANT WATER REQUIREMENTS

Fresh Groundwater

The revised project (TMPP 2000a) is now designed to use a parallel wet/dry hybrid cooling system, rather than the wet only system proposed in the original project design. The new cooling system consists of a water-cooled system and air-cooled system in a parallel arrangement. Steam turbine exhaust flows to both the water-cooled condenser and air-cooled condenser. The air-cooled system is sized for 100 percent steam condensing duty at 48 ^{o}F. The air-cooled system will reduce annual water consumption and visual impacts from the cooling tower plume.

The water-cooled system is sized for 100 percent heat rejection capacity at a 98 ^{o}F dry-bulb (66 ^{o}F wet bulb) which will allow design capacity electricity generation during the summer, when power demand is greatest. In order to allow BMP and TMP to use no more then 350 acre-feet/year together, TMP indicates that BMP will be "retrofitted with a hybrid cooling water system" to reduce water use, or will reduce operations, or both (TMPP 2000a).

The water needs of the project operating under various scenarios that include BMP operation, at different temperatures are shown in Soil & Water Table 2 (TMPP 2000a).

Soil and Water Table 2[1]
Water Requirements

Dry Bulb Temperature (°F)	**Relative Humidity (Percent)**	**Water Requirement** Operating Scenario 1 **(gpm)**	**Water Requirement** Operating Scenario 2 **(gpm)**
98	18.6	2728	2728
85	25.4	2484	2484
73	35.3	1451	2264
48	68.3	169	169

[1]TMPP 2000a
Operating Scenario 1 – Burney Mountain Power uses only 125 AFY of water and Three Mountain Power uses the remaining 225 AFY
Operating Scenario 2 – Burney Mountain Power is not operating and all 350 AFY is used by Three Mountain Power

The proposed project (TMPP 1999a) will obtain its water supply from the BWD with groundwater as the source. BWD will construct and operate two new wells to be located approximately 4,700 feet from the site, which will be constructed similarly to existing wells (TMPP 2000a). They are expected to produce about 1,500 gpm each, be approximately 300 feet deep, screened 100 feet below ground surface, with the annular space sealed from the surface to 50 feet below ground surface.

The revised project has been configured for a maximum consumptive use of 600 acre-feet per year of groundwater for its sole use (TMPP 2000a). The adjacent BMP facility currently uses up to 350 acre-feet per year of groundwater for cooling water purposes. TMP will be permitted to use groundwater from BMP up to BMPs current maximum use amount of 350 acre-feet/year only if it is not used by BMP. In other words, this 350 acre-feet/year will be shared between BMP and TMP. The maximum possible amount of groundwater that will be permitted for the TMP project is 950 acre-feet/year, i.e., 600 acre-feet/year dedicated to TMP and 350 acre-feet/year dedicated to BMP and/or TMP.

Staff notes that there is a discrepancy about BMP's historical use of water. TMP describes BMP's average annual use of water as being 350 acre-feet per year in their revised project proposal. However, previous reports by TMP (Lawrence and Associates, April 1999 and Dames and Moore, March 2000) described BMP's average annual net use of water as being 270 acre-feet a year. This net use was calculated by subtracting the BMP discharge to the BWD for waste water recycling and percolation from the 300 acre-feet per year pumped by the BMP. However, although there is still confusion on this issue, staff based its analysis on the more recent figures contained in TMP’s mitigation proposal, i.e., 350 acre-feet per year.

TMP will not use the existing BMP well, and an interconnection between the BMP well and the TMP facility will not exist, i.e., there will be no pipeline between the BMP well and TMP facility. TMP has committed to enter into a contract with BWD to ensure that the TMP project does not exceed a maximum groundwater use of 950 acre-feet/year, which will involve the use of BWD installed water meters (TMPP 2000a). It will be necessary to meter both BMPs and TMPs water use to ensure that the combined groundwater use by TMP and BMP do not exceed 950 acre-feet/year. A Condition of Certification has been proposed to ensure compliance with this agreement, as staff’s analysis and conclusions are based on the assumption that the project uses nor more than 950 acre-feet/year of groundwater.

Recycled Wastewater

The revised project, as currently proposed, includes an optional provision for using recycled water provided by the BWD Publicly Owned Treatment Works (POTW) as an additional source of cooling water. This water source does not currently exist, and there is no certainty that it will be available in the future. While TMP indicates that they will ”…utilize all the recycled water that the BWD WWTP can provide.” (TMPP 2000a), staff recommends that the Commission limit any recycled water use at the BWD POTWs current design capacity due to biological concerns discussed in the Biological Resources section.

In a letter requested by CEC staff (letter from William R. Suppa of BWD to Richard Sapudar of CEC dated October 25, 2000) the BWD POTW design capacity is given as 440,000 gallons per day (GPD). The current average dry weather flow is stated as approximately 300,000 GPD, with the average wet weather flow being approximately 350,000 GPD, with occasional peaks exceeding this amount. The projects estimated water use during the year is shown in Soil & Water Table 3.

SOIL & WATER TABLE 3
ANNUAL PROCESS WATER CONSUMPTION

Month	**Monthly Mean Max (°F)**	**Monthly Mean Min (°F)**	Average Supply Operating Scenario 1 **(gpm)**	**Average Supply** Operating Scenario 2 **(gpm)**
January	44	18	169	169
February	50	22	180	180
March	54	25	221	221
April	62	29	354	354
May	70	35	546	622
June	79	41	815	1,064
July	87	43	1,125	1,280
August	86	41	1,035	1,239
September	81	35	794	991
October	69	28	482	482
November	54	24	220	220
December	45	20	169	169
Average			512	589
Annual Usage			825	950

Operating Scenario 1 – Burney Mountain Power uses only 125 AfY of water and Three Mountain Power uses the remaining 225 AFY
Operating Scenario 2 – Burney Mountain Power is not operating and all 350 AFY is used by Three Mountain Power

Impact Assessment of Recycled Wastewater Use

Recycled water is regulated under the California Safe Drinking Water Act, Title 22, Chapter 3, Article 7, section 60323, and requires an engineering report for a wastewater recycling plant. Such a report is prepared by a qualified California Registered Engineer, and is reviewed by the California Department of Health Services. Permits (Water Recycling Requirements) are prepared by the RWQCB and are based on the engineering report. The CDHS reviews water reclamation projects under Water Code section 13554, and provides guidance to the RWQCB. The recycled water will meet CDHS standards for disinfected tertiary recycled water through additional filtration and chlorination..

The major concerns with the use of recycled water include the generation of aerosols and contact of potable and nonpotable recycled water. CDHS typically requires an air-gap separation, which provides for potable and recycled water supplies to be gravity fed into a containment vessel prior to entering the plant. In addition, drift eliminators will be used on the wet cooling towers to minimize aerosol generation.

The wastewater treated by the BWD at its POTW is primarily derived from the groundwater that is used by its customers for either domestic, industrial, or other municipal purposes. The BWD POTW provides secondary treatment for this wastewater and then discharges it to percolation ponds that transmit it to the groundwater aquifer. An analysis of BWD wastewater was provided by TMP, with the results obtained from the percolation ponds indicating that the TDS concentration in the pond water was 216 mg/L (TMPP 2000a).

Any wastewater that is not recharged to the groundwater aquifer from the BWD percolation ponds is not available to recharge the groundwater aquifer. Therefore, the project's use of the 440,000 GPD (or 500 acre-feet per year) currently discharged to percolation ponds and ultimately to the regional aquifer will be addressed in the water supply assessment of impacts below.

Water quality impacts to the use of this recycled water consist of some improvement in groundwater quality downgradient from the BWD percolation ponds. This issue is discussed further in the Wastewater section below. This testimony includes a Condition of Certification to address the use of recycled water by the project.

IMPACT ASSESSMENT OF WATER USE

The impact assessment of water use includes an analysis of drawdown impacts and of water supply impacts. Drawdown is the decline in groundwater levels that is caused by pumping. Drawdown creates a cone of depression in groundwater levels in the aquifer surrounding the well. Drawdown, which would affect both water supply wells and regional springs, can represent significant adverse impacts under certain circumstances. Water supply impacts address the effect of the project’s consumption of water on springs in the Burney and Hat Creek basin whose flow may be reduced by that use.

Drawdown Impacts

Significant drawdown impacts would occur if the project's pumping causes substantial and unacceptable declines in groundwater levels in existing nearby wells and in discharge to springs.

There are four adverse well interference impacts that could occur as a result of the project .

1. Declines in groundwater levels in affected wells would increase the pumping lift and would correspondingly increase energy costs.
2. The productivity of affected wells could significantly decrease if the declines in groundwater levels significantly reduced the saturated interval from which the wells draw water.
3. Declines in groundwater levels in affected wells could require the lowering of well bowls to maintain efficient operation and to prevent equipment damage.
4. If the declines in groundwater levels caused the water levels in affected wells to drop below the depth of the well, the wells would go dry. Less dramatic, but with the same effect, if well interference caused groundwater levels to drop

below the effective pumping depth of the nearby wells, the pumps would "suck air" and the wells would be unusable. This potential adverse impact is more likely to occur if the aquifer is unconfined near the project well field. In an unconfined aquifer, drawdown causes the aquifer to dewater within the radius of influence.

The depth and radial influence of the pumping drawdown are determined by the rate of pumping, the depth of the well screens (well construction specifications), and the local aquifer properties. The aquifer properties include storage, hydraulic conductivity and anisotropy, and the thickness of the aquifer. As discussed previously, anisotropy, the directional differences in hydraulic conductivity, is highly variable in a fractured rock aquifer. In an unconfined aquifer, the specific yield is the most important component of aquifer storage.

The calculation of drawdown is usually based on one of several standard equations, using an estimate or calculation of aquifer properties, a representative pumping rate, a time period, and the location of the pumping well relative to the existing, nearby wells. In a typical sand-and-gravel aquifer, the magnitude of the drawdown can be estimated if aquifer property values are based on conditions measured in the nearby wells. Aquifer properties include hydraulic conductivity, thickness of the aquifer, anisotropy and specific yield. However, given the extreme variability in hydraulic conductivity of wells in the Burney area, the likelihood of anisotropic conditions, and the lack of information on specific yield, the magnitude of drawdown in the project wells is very difficult to predict.

Of these four parameters, we have the most information regarding aquifer thickness and hydraulic conductivity. The aquifer is

Hydraulic conductivity controls the shape and extent of drawdown. If hydraulic conductivity is low, drawdown will be relatively deep at the well, but will quick dissipate with distance from the well. If hydraulic conductivity is high, drawdown will be shallow and will effect a larger area around the well. Staff evaluated the hydraulic conductivity of the Burney aquifer based on specific capacity data reported on wells logs for the Burney area (Lawrence and Associates, April 19, 1999). This evaluation showed that hydraulic conductivity in the Burney aquifer ranges from 3 feet per day to over 7,000 feet per day (Soil & Water Tables 4 and 5).

The details of the calculation is as follows: Data was used from large wells that are similar in size to the proposed project well (production rates greater than 1000 gallons per minute (gpm)) and that had complete records for (1) drawdown, (2) depth to the top of well screen, and (3) well completion depth. This information was needed to calculate hydraulic conductivity. Transmissivity is roughly equal to 1500xQ/b; hydraulic conductivity equals transmissivity divided by thickness of the screened interval or the thickness of the aquifer. (Driscoll, 1986). Typically in calculating the hydraulic conductivity of sand and gravel aquifers, which are horizontally layered, the thickness of the screened interval is used in this calculation. Pumping primarily draws water to the well from the horizontal direction. This assumption was used in the calculations for Soil & Water Table (4 below).

SOIL AND WATER Table 4

Calculation of Effective Hydraulic Conductivity
Based on Screened Interval of Well

Q Discharge (gpm)	**s** Drawdown (feet)	**Q/s** Specific Capacity (gpm/ft)	**T=1500 Q/s** Transmissivity (sq ft/day)	**Z^1** Top of Screen (feet)	**Z^2** Well Depth (feet)	**$Z^2 - Z^1 = b$** Screened Interval (feet)	**K=T/b** Effective Hydraulic Conductivity (feet/day)
1040	30	35	6,952	130	184	54	129
1040	5	208	41,714	110	181	71	588
1050	192	5	1,097	90	449	359	3
1400	0.75	1,867	374,360	30	206	176	2,127
2500	37	68	13,551	90	236	146	93
3290	9	366	73,312	170	320	150	489
3700	2	1,850	371,018	250	300	50	7,420
4300	3	1,433	287,455	80	205	125	2,300
Minimum							3
Maximum							7,420

Based on information from available well logs, the saturated thickness of the Burney aquifer is approximately 250 feet thick. If we recalculated hydraulic conductivity and assume that water was draw from the entire thickness of the saturated aquifer, assuming that water is drawn from above and below the well screen, the calculated range of hydraulic conductivity for the Burney aquifer is more conservative, ranging from 4 feet per day to 1,484 feet per day (Soil & Water Table 5 below). These values are probably more accurately reflect the actual hydraulic conductivities of the aquifer system.

SOIL & WATER Table 5

Calculation of Effective Hydraulic Conductivity
Based on Approximate Thickness of Saturated Aquifer

Discharge (gpm)	Drawdown (feet)	Specific Capacity (gpm/ft)	Transmissivity (sq ft/day)	Saturated Aquifer Thickness (b, feet)	Effective Hydraulic Conductivity (feet/day)
1040	30	35	6,952	250	28
1040	5	208	41,714	250	167
1050	192	5	1,097	250	4
1400	0.75	1,867	374,360	250	1497
2500	37	68	13,551	250	54
3290	9	366	73,312	250	293
3700	2	1,850	371,018	250	1484
4300	3	1,433	287,455	250	1150
Minimum					4
Maximum					1,484

According to the literature on hydraulic conductivity, permeable basalt aquifers range from 0.1 foot per day to 10,000 feet per day (Freeze and Cherry, 1979), with productive values in the upper range; this analysis shows that Burney aquifer spans the upper end of that range. In fact, the Burney aquifer varies over 3 orders of magnitude. In comparison, the typical sand and gravel aquifers, the effective permeability of will usually vary over only one order of magnitude. Much less is known about specific yield and anisotropy of the Burney aquifer.

Only indirect information regarding specific yield is available in the basin. According to the literature, porosity, which is roughly equivalent to specific yield in fractured rock, has a wide range of values from 5 to 50 percent (Freeze and Cherry, 1979, p 37). Specific yield for the project wells depends on the degree of unfilled fractures in the aquifer in the vicinity of the well field. A rapid response in groundwater levels and discharge from springs is an indication of low specific yield. Groundwater level records for BWD Well 3 and Well 7 show a rapid response to changes in precipitation with groundwater levels (CH2M Hill, 1988). Rose (1995) reports that in Hat Creek, with a similar fractured basalt flow aquifer system, discharges from springs declined rapidly during the recent 1988-1992 drought.   Staff has surmised from this evidence that specific yields in Burney basin is probably low. If specific yield is low, drawdown will be deeper and more extensive than if specific yield is high.

Correspondingly, anisotropy of hydraulic conductivity has not been measured in the Burney aquifer. Anisotropy will cause more water to be drawn from one direction than another. However, it is reasonable to assume that the aquifer system is be more transmissive south to north along the trend of the major regional faulting.

The potential variability of these aquifer properties demonstrate the uncertainty in predicting drawdown impacts for the project prior to field testing. Given the range of variables for hydraulic conductivity, anisotropy and specific yield, calculation of potential drawdown impacts prior to the aquifer testing of project wells is speculative. Confirmation and quantification of significant adverse impacts to nearby wells and springs cannot be assessed until the results of aquifer testing for the actual project wells is available. However, the nearby wells and springs that could be potential impacted can be identified.

Accordingly, drawdown effects on nearby wells will be determined after the site-specific testing is completed. The nearest well to the proposed project site is located about 6,000 feet from the site. This well is owned by Jerry Hathaway. Any drawdown effects on Mr. Hathaway's well or any other nearby wells that are significant can be mitigated. Drawdown of more that 5 feet would be considered significant and mitigation would appropriate.

The effect of project drawdown on nearby springs could cause substantial declines in spring discharge. The two nearest springs to the proposed project well field are Rocky Ledge and Crystal Lake springs. TMP reports that Rocky Ledge spring at an elevation of 2989 feet and Crystal Springs at an elevation of 2986 feet are at or below groundwater table levels in the nearest measured wells reported by TMP (2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California) and Fox (May and June, 2000). Even a small drawdown in groundwater levels at these springs could cause a decline in the discharge rate of water. Just as the estimated drawdown for the nearby wells is relatively small with respect to the total pumping lift, if the outlet for the spring is small, a drawdown of a few inches would represent a relatively large change.

Although measurement of the drawdown effect on springs is impractical, calculated drawdown, based on the aquifer field tests would provide some estimate of the magnitude of project impacts to nearby springs. However, the depletion of the springs likely to be affected would only affect the springs themselves and would have no impact on the public water supply. Assessment of impacts to biota dependent on these springs, owing to the decline of discharge to springs, is in the biological assessment.

TMPP Analysis of Drawdown Impacts

TMP has calculated an estimate of drawdown for several pumping scenarios (DM, 2000a, p 3-3 and DM, 2000b). The scenario that produced the maximum impact to nearby wells and springs used the following parameters as shown in Soil & Water Table 6. (This report will refer to this analysis as TMP's worst case scenario.):

SOIL & WATER Table 6
Parameter Values Used in TMPP Analysis of Drawdown

Aquifer Test Parameter	Parameter Value
Pumping period	1 year
Pumping rate (variable over pumping period)	950 acre-feet/year
Saturated aquifer thickness	250 feet
Effective Hydraulic conductivity (isotropic)	300 feet/day
Anisotropy toward the impacted well or spring	10:1 (hydraulic conductivity of 950 feet/day X 95 feet/day)
Specific yield	23%

A review of this worst case scenario indicates that TMP makes some assumptions that are reasonable, some that would underestimate the actual pumping conditions that would occur, and some that are speculative. It assumes that project will only use 300 acre-feet of recycled water annually, although there proposal is to use up to 500 acre-feet per year, if the production of recycled water increases with time. It also assumes that BMP has consumed an average of 350 acre-feet per year, which contradict previous information provided by the TMP (Lawrence and Associates, April 1999 and Dames and Moore, March 2000). This scenario evaluated a pumping period of only 1 year in duration under transient conditions, which would tend to underestimate project impacts..

Transient conditions represent how the aquifer behaves under changing conditions. Although TMP did evaluate drawdown impacts for the life of the project in another scenario, pumping was evenly distributed throughout the year and steady state conditions were assumed, which would tend to underestimate project impacts. Actual conditions will reflect variable seasonal water use over the life of the project under transient conditions. Finally, TMP apparently considered groundwater recharge in some or all of the drawdown analyses. Recharge should not be considered in the evaluation of drawdown impacts, as discussed above. Recharge will occur with or without the project. The purpose of the drawdown analyses is to evaluate the impacts of the project on existing conditions.

As discussed in detail in the staff's assessment of drawdown, aquifer parameters are highly uncertain and highly variable for the Burney aquifer. TMP's selection for aquifer thickness is reasonable. TMP's used a mid-range value for effective hydraulic conductivity, however their analysis does not consider the range of likely values or the corresponding associated impact. TMP's selection for anisotropy is, of course, speculative. However, TMP assumed that anisotropy would be oriented for maximum impact to the spring or well under evaluation. Given that both the nearest well and the nearest spring are located north of the proposed well field, this was a reasonable assumption. Finally, TMP selected a specific capacity value that is relatively high, given the apparent low porosity of the aquifer, which was discussed in the staff evaluation of drawdown. This value would tend to underestimate project impacts.

TMP's worst case analysis predicted impacts to the Hathaway well and to Rocky Ledge springs. TMP did not consider impacts to Crystal Lake springs.

TMP calculated that the project would cause a maximum of one foot of drawdown impact in the summer in the Hathaway well, which is identified as the closest active well to the proposed project well field (DM, 2000a). TMP reports that pumping lifts for wells in the vicinity of the project wells are more than 100 feet (DM, 2000a). Given their calculation of drawdown, TMP concludes that well interference caused by the project is likely to be comparatively small compared to the overall lift.

While any increase costs for pumping lift may be relatively small as compared to the current lift costs, moderate drawdown could still impact shallow well and shallow bowls, as discussed in the staff's analysis of drawdown. Furthermore, if wells are relatively shallow or bowl elevations have been set close to the water table to minimize pumping lift, moderate well interference could pose a problem. A reduction of 5 feet or more could significantly reduced the saturated interval of the wells screen and the productivity of the well or draw groundwater levels below the safe operating level of the bowl. Private residential wells would be particularly vulnerable to the impacts of well interference because they tend to be shallower than agricultural or municipal production wells. Staff has recommended that the Commission require compensation to the well owner within a two mile radius of the sit if the results of the aquifer tests indicate that their water levels will decrease by five feet or more.

TMP also calculated that the project would cause a maximum of 0.15 feet (1.8 inches) of drawdown in the Rocky Ledge spring, which is identified as the closest spring to the proposed project well field. TMP concluded that this impact would probably be less than predicted owing to delayed yield from storage and recharge and that the actual impact would be negligible. Recharge should not be considered in the evaluation of drawdown impacts, as discussed above. Delayed yield might play a part in evaluation of seasonal impacts but would not be a factor in evaluating long term impacts of the project. Both of these assumptions would underestimate the impact of project drawdown.

It should be noted that TMP has proposed to perform aquifer test of the project wells and to recalculate project drawdown impacts. All of the issues regarding the factors used in the TMP analysis can be resolved when the project drawdown impacts are recalculated using field test values.

Staff Analysis of Water Supply Impacts

Water supply impacts include all changes in water flows within the Burney basin that would be caused by the project. Project water consumption will potentially impact springs in the Burney basin and the Hat Creek basin that are both within and beyond the likely cone of depression of project pumping (drawdown zone) because the project will use water that would otherwise discharge from the aquifer as springs or seeps. Potential impacts from use of both fresh groundwater and recycled water are considered in this section.

Springs that clearly discharge above the groundwater table will not be affected by groundwater pumping for the project. Springs in this category include those that discharge to Burney Creek, which flows above the groundwater table, except in the immediate vicinity of Burney Falls. The occurrence of these high elevation streams and springs result from the capture of snowmelt and rainfall runoff, which infiltrates the shallow fractures at the surface of a basalt flow, travels down gradient along the fractures and discharges where the fractures terminate at land surface.

For a similar reason, project consumption of recycled water probably would affect Burney Creek. The project's proposed use of recycled water from the Burney Wastewater Treatment Plant would decrease discharge that reportedly flowed horizontally from the wastewater plant's percolation ponds to Burney Creek during heavy rainfall periods. However, given the problems of flooding along the creek, this effect would probably be a positive impact. Nonetheless, diversion of this water for powerplant consumption would cause a decrease in the amount of wastewater that recharges the aquifer and must be included in the net calculation of water consumption by the power plant.

The project water consumption will impact basin outflow by using water that would otherwise discharge from the Burney aquifer as springs or seeps. The impact of the project depends on the relative rate of project water consumption as compared to the discharge rate of the impacted springs. Given the regional south-to-north direction of groundwater flow and the likely direction of aquifer anisotropy, project pumping will clearly capture and consume groundwater that would otherwise discharge from springs at the terminus of the Burney aquifer at the northern end of the basin.

Project water consumption may also impact springs that discharge to Crystal Lake springs. Crystal Lake springs is on the western side of Hat Creek within the poorly defined topographic divide between Burney basin and the Hat Creek basin (Figure 1). Groundwater levels collected by TMP (2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California) and Fox (May and June, 2000) indicate that the groundwater system north and south of Crystal Lake is contiguous with the lake (Soil & Water Figure 2). To the extent that water used by the project subtracts from the total regional water supply, the project is likely to also subtract from the total water that discharges from the Crystal Lakes springs.

Burney Falls

Developing an accurate estimate of groundwater discharge rates for Burney basin has proved to be difficult task, given the lack of long-term measurements of discharge from springs, of groundwater levels, or even of precipitation for Burney basin. Although Burney Falls is the primary discharge point for water exiting the basin, only one period of continuous discharge measurements has been performed; the U.S. Geological Survey monitored flows in Burney Falls during water year 1921 (USGS, 1960) (Soil & Water Table 7 and Soil & Water Figure 3).

SOIL & WATER Table 7

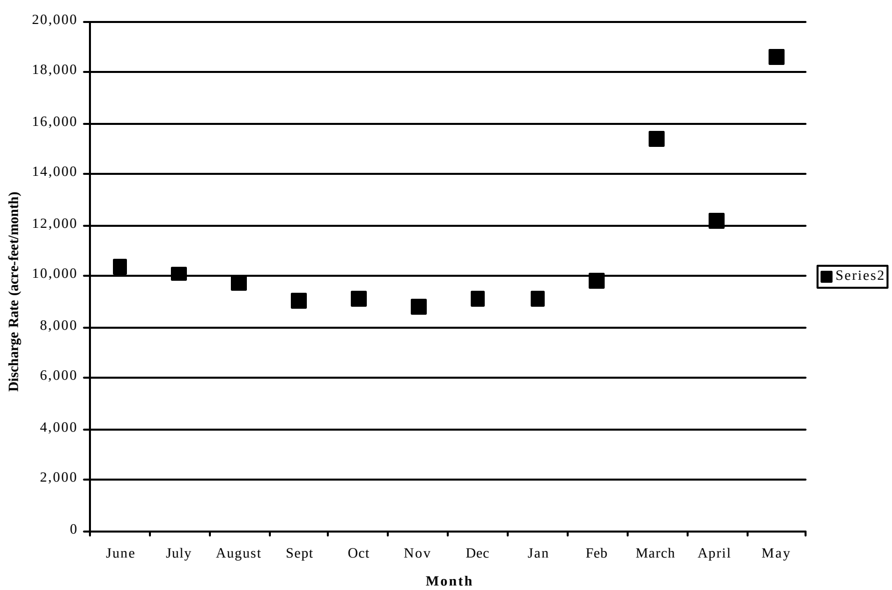
Total Outflow at Burney Falls (Including Burney Creek)
June 1921 through May 1922

Month	Mean Rate of Discharge	
	(cfs)	(af/month)
June	174	10,400
July	164	10,100
August	159	9,780
Sept	152	9,040
Oct	148	9,100
Nov	148	8,810
Dec	148	9,100
Jan	148	9,100
Feb	177	9,830
March	251	15,400
April	205	12,200
May	303	18,600
Annual Mean	183	132,000

Source: USGS (1960) Burney Creek Measured Below Burney Falls

SOIL & WATER Figure -3-

Total Outflow at Burney Falls (Including Burney Creek)
June 1921 through May 1922



Seven, single flow measurement have also been collected for Burney Falls. These very limit data alone are inadequate to quantify the likely flow that occurs under the normal range of hydrologic conditions in Burney basin (Soil & Water Table 8).

SOIL & WATER Table 8
Total Outflow at Burney Falls (Including Burney Creek)
Single Measurements

Date of Measurement	Rate of Discharge (cfs)	Data Source Cited
September 8, 1903	210	USGS, 1927, Water Supply Paper 557
September 1, 1988	183	CH2M Hill, 1988
October 17, 1991	130	PG&E
November 6, 1991	130	PG&E
June 4, 1992	142	PG&E
September 8, 1994	122	California Dept. of Fish and Game
May 2000	180	Dames&Moore, June 2000

Source: TMPP (2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California)

Given the lack of good information, there are several different approaches that can be used to assess the impact of project water use on Burney Falls, as well as the other groundwater-fed springs in the Basin. Two such approaches are the development of a water budget for the basin and the use of existing hydrologic studies on similar systems to analyze Burney basin. TMP largely used the water budget approach, which is discussed in the following section. Staff determined that the best approach to evaluate hydrologic conditions in Burney basin was to use existing studies for Hat Creek basin as a model for Burney basin.

Staff Analysis of Existing Studies

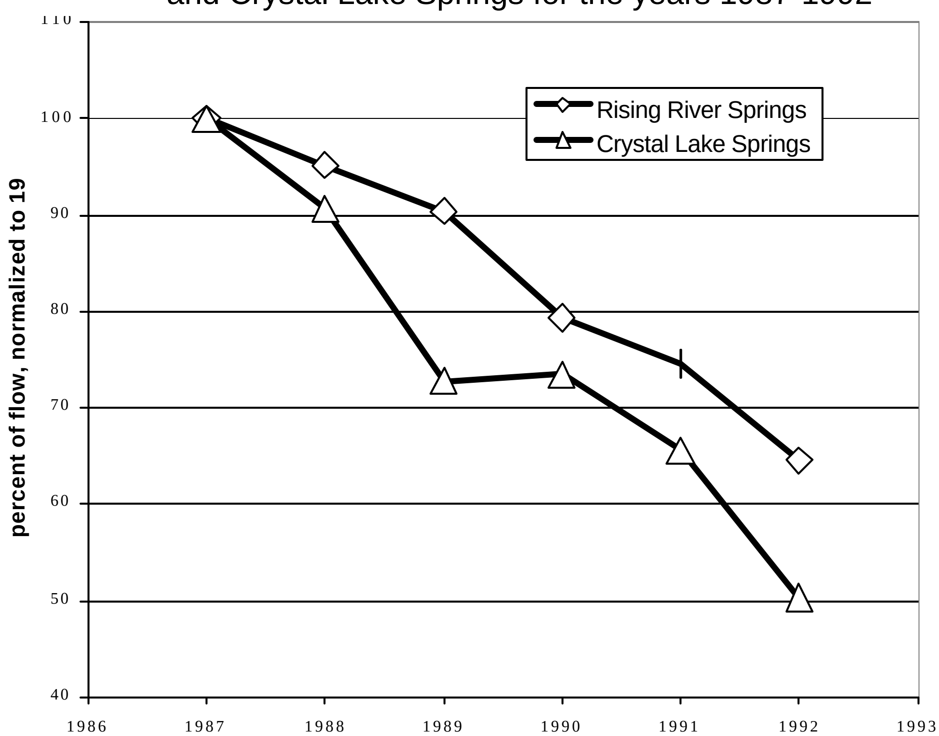
The Hat Creek basin is adjacent to Burney basin. The two basins are joined at Burney basin's eastern boundary, and topography is hydrologic divide is poorly defined. Basalt flows blanket both basins and groundwater levels, as well as isotopic studies indicate that the two basins are connected hydrologically (Rose, 1995 and 2000a, 2000; TMPP, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California; Fox, May and June, 2000). The hydrology of Hat Creek is similar to Burney system in that recent fracture basalt flows are the primary aquifer and large volume springs emerge from the terminus of these basalt flows. Given the similar location, precipitation, geology and rates of discharge, Rose's study provides a simple model of the likely behavior of the region's large-scale springs during drought that can be applied to Burney basin.

Staff is particularly concerned about the project's potential impacts on the basin's water supply during drought. Rose (Rose, et. al., 1995) developed a precipitation-discharge relationship for the two primary spring systems in Hat Creek, Crystal Lake springs and Rising River springs, as part of a larger study on the regional hydrology of the Lassen area. Rose's precipitation-discharge analysis focused on evaluating the response of springs during the recent 1988-1992 drought.

A good comparison can be made between Burney basin's primary spring, Burney Falls, and the primary springs in Hat Creek. The discharge of Crystal Lake springs and Burney Falls are similar, 82,000 acre-feet per year and 107,000 acre-feet per year, respectively. See Figure 4. Rising River springs is about twice as large as Burney Falls at an average discharge rate of 200,000 acre-feet per year. (Rose, 1995) The response of Crystal Lake springs and Rising River springs to drought bracket the likely response of Burney Falls to drought, given the similarity of the Burney and Hat Creek systems.

SOIL & WATER FIGURE 4

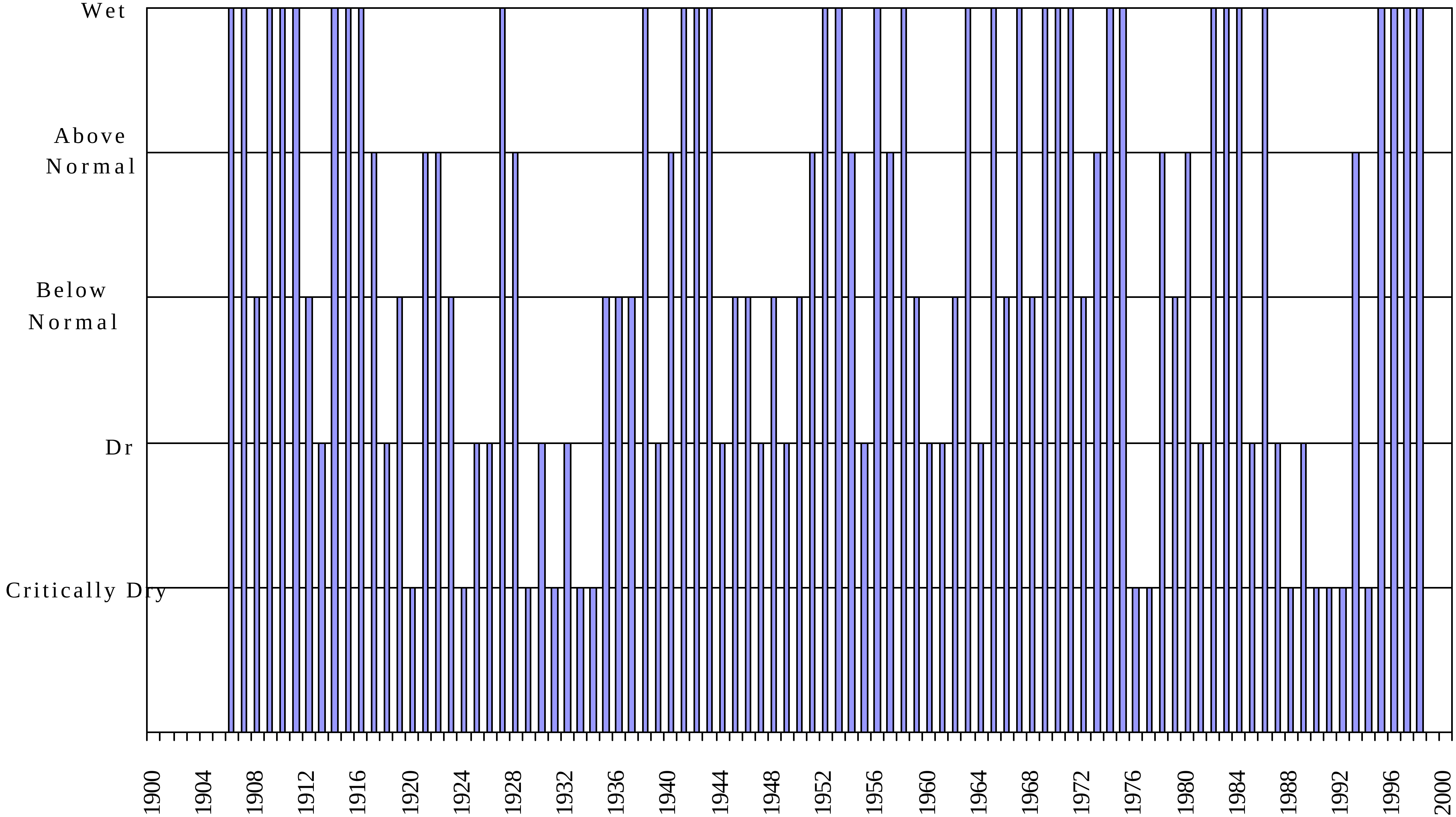
Normalized Mean Annual Discharge for Rising River Springs and Crystal Lake Springs for the years 1987-1992



Source: Rose, 1995, page 213

The next step in staff's evaluation of project impacts on the water supply of Burney Falls was to identify a discharge rate to represent normal conditions. As discussed above, measurements performed in 1921 to 1922 are the only full-year reference point available for Burney Falls. To place 1921 in a long-term hydrologic context, Water Year 1922 (October 1921 through September 1922) was an above average hydrologic year in the beginning of a 20-year drought (Figure 5) (DWR, Sacramento Valley Water Year Hydrologic Classification Index). The single measurements of

Figure 5
Water Year Hydrologic Classification Indices
Updated 11/30/98



low for Burney Falls (Table 8) are too limited and incomplete to provide a basis for evaluating the 1921 to 1922 flow record. Long-term historical precipitation data for Burney basin or land-use data for the 1920's that would have affected consumption in the basin, could provide information to evaluate if Burney Falls flows in 1921-1922 were normal. However, staff used the 1921-1922 flows for Burney Falls of 132,000 acre-feet per year to represent annual discharge rate for Burney Falls under normal conditions, recognizing the uncertainty of this assumption.

Using Rose's analysis as a model, the normalized discharge at the two springs in his analysis can be used to estimate the change in discharge for Burney Falls as the 1988-1992 drought.

- Based on the changes in discharge from Crystal Lake, the outflow from Burney aquifer would be reduced by about 50 percent. Using the 1920 flows for Burney Falls to represent normal flow conditions (132,000 acre-feet per year, including Burney Creek flows) and applying the Crystal Lake springs model, discharge from Burney Falls would be reduced to about 66,000 acre-feet per year during a drought similar to the recent drought. With this analysis, the project impact would represent about 1.7 percent decrease in flows by the fifth year of the drought, based on a maximum consumption rate of 1,100 acre-feet per year (600 acre-feet of fresh groundwater and maximum of 500 acre-feet of recycled water).
- Using Rising River as a model, which would represent an upper limit for Burney Falls, the outflow from the Burney aquifer would be reduced by about 65 percent during a drought that was similar to the 1988-1992 drought. Based on the Rising River model and the 1920 flows for Burney Falls to represent normal flow conditions, discharge from Burney Falls would be reduced to about 86,000 acre-feet per year. With a maximum consumption rate of 1,100 acre-feet per year (600 acre-feet of fresh groundwater and maximum of 500 acre-feet of recycled water), the project impact would be about 1.3 percent decrease in flows by the fifth year of the drought using the Rising River Model.

A brief discussion regarding the use of the drought 1988-1992 as a model is needed. Although this recent drought was severe, it should not be assumed that it represents the reasonable worst case drought for Burney basin. Water year 1977 was the most severe single drought year on record for northern California and a 20-year drought persisted from the mid-1910's to the mid-1930's. Therefore, although an analysis of future drought probability is beyond the scope of this assessment, it is certainly reasonable to assume that a drought that would be more severe than the 1988-1992 drought may occur within the life of the project.

It is also reasonable to assume that the spring discharge decline indicated by Rose's analysis would continue in a drought with a similar severity as the 1988-1992 drought. Based on Rose's work, the flows of Crystal Lake springs declined at a rate of about 10 percent per year during this period and spring flows to Rising River declined at a rate of 7 percent per year and would be expected to continue at this rate for a longer drought of similar severity.

For the sake of illustrating this point, Table 9 shows the rate of decline in discharge from Burney Falls, given a hypothetical drought of similar severity to the 1988-1992 that continues for 10 years, Under these hypothetical conditions, Burney Falls would cease to flow, based on the Crystal Lake model. Using the Rising River model, flows would cease in Burney Fall after 15 years, given this hypothetical, prolonged drought.

However, it is important to note that there is no drought in the historical record that has caused the cessation of flow to the region's major springs. The point of this hypothetical analysis is to demonstrate that project water use would continue to have a small impact on of the discharge from Burney Falls even if a very severe drought occurred.

SOIL & WATER Table 9
. Annual Decline in Flows from Burney Falls
Hypothetical Drought - Based on 1988-1992 Drought Conditions

Duration of Drought (years)	Crystal Lake Springs Model		Rising River Springs Model	
	Burney Falls Discharge (afy)	Maximum Project Impact (percent)	Burney Falls Discharge (afy)	Maximum Project Impact (percent)
0	132,000	0.83%	132,000	0.83%
1	118,800	0.93%	122,760	0.90%
2	105,600	1.04%	113,520	0.97%
3	92,400	1.19%	104,280	1.05%
4	79,200	1.39%	95,040	1.16%
5	66,000	1.67%	85,800	1.28%
6	52,800	2.08%	76,560	1.44%
7	39,600	2.78%	67,320	1.63%
8	26,400	4.17%	58,080	1.89%
9	13,200	8.33%	48,840	2.25%
10	0		39,600	2.78%
11			30,360	3.62%
12			21,120	5.21%
13			11,880	9.26%
14			2,640	41.67%
15			0	

Based on these analyses, staff has determined that the project's water use will cause no project specific impacts on Burney Falls under foreseeable hydrologic conditions.

Other Springs

The other springs that are located at or below the groundwater table also would be potentially impacted by the project. This group includes the springs located in the northeast portion of the basin that were surveyed by TMP this summer. Prior to this work, only a few single measurements had been made for Salmon Springs. The small springs included in this group are the three Salmon Springs, Rim of the Lake Spring, Sand Pit Road Spring, Hat Creek Park South Spring, Canal Spring, and Rocky Ledge Spring. Crystal Lake is also included in this group because it appears to be hydraulically connected to the Burney aquifer as indicated by groundwater measurements and contours developed by TMP (2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California) and Fox (May and June, 2000).

Unfortunately, the lack of information on preferential flow paths within the aquifer system prevents staff from determining if any of the smaller springs are disproportionately impacted by project water use. If a large proportion of the project water consumption impacted any single small spring, there would be a substantial decline to the spring's water supply even under normal conditions. However, in the absence of evidence that this is likely to occur, staff concluded that it was most reasonable to assume that project impacts would proportional to the total volume of basin discharge. Based on discharge of 132,000 acre-feet per year for Burney Falls and available data on the other springs in the basin, the average annual discharge from the basin is 152,000 acre-feet per year. As discussed previously, the uncertainty in the estimate of normal flow rates for Burney basin should be recognized. Based on these assumptions, project water use is not expected to result in a substantial reduction in flows to these springs.

Therefore, it is likely smaller springs do appear to be disproportionately impacted by drought. Although the TMP survey of springs provided a snapshot of the current flow conditions only, Rose's 1995 study does indicate the rate of decrease in discharge to Crystal Lake springs, the smaller of the two springs considered, was more rapid than the rate of decrease in discharge to Rising River. Although Rose's work does not provide enough data to estimate the relationship between spring size and rate of response to droughts, it is does corroborate field observations. Researchers have reported that smaller springs responded more quickly to the 1988-1992 drought (Ellis, Issues Resolution Workshop in Burney on June 19, 2000 and Rose, verbal communication, 2000).

Furthermore, the relative impact of project water use would increase as the discharge of small springs decreased in response to droughts. Under foreseeable drought conditions, it is somewhat more likely that the project would cause more substantial reductions in flows to one or more of the small springs than it would to Burney Falls. Unfortunately, given the lack of historical long-term discharge data on small springs, as well as the lack of information on preferential flow paths within the aquifer system, it is not possible to quantify the extent of these reductions.. Finally, water from the small springs is not used for human consumption. Therefore, Staff has concluded that the project specific impacts on small springs would not be significant.

The effect of project water consumption on Crystal Lake springs would be similar to the effect of the project to Burney Falls. Similarly, project water use is not expected to result in a substantial reduction in flows to Crystal Lake springs. However, although Crystal Lake springs are about the same size as Burney Falls, biological staff considers spring flows to be more critical because of the presence of Shasta Crayfish (see Biological Section). Nonetheless, water from Crystal Lake springs are not used for human consumption and, therefore, project specific impacts on water supply itself to Crystal Lakes springs would not be significant.

TMPP Analysis of Regional Water Budget

TMP took a different approach to the task of assessing project specific impact to water supply by develop a water budget for Burney basin. A water budget is an accounting of inflows, outflows, consumption, and change in storage of a specified area. CH2M Hill (1988) previously developed a water budget of Burney watershed for the BWD to determine the available water supply. Lawrence and Associates (TMPP 1999a, Appendix J) updated this information, developing a water budget for normal, wet and drought conditions, and Dames and Moore subsequently expanded this analysis (DM, March 2000, and DM and LA, July 16, 2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California, Table D2) and water consumption in 2030).

TMP's most recent water budget for normal conditions in Burney basin is shown in SOIL & WATER Tables 10 below.

Based on its water budget analysis for average hydrologic conditions, TMP has calculated that the maximum impact to Burney Falls would be less than 1 percent reduction in discharge during normal hydrologic conditions with current and future water use conditions. This TMP assessment is based on a maximum project consumption rate of 900 acre-feet per year. TMP assumes that the total discharge rate for Burney Falls would be 132,000 acre-feet per year for normal hydrologic years under current conditions, based on TMP's normal year water budget. Further, TMP assumes that impacts to the other springs in the region will be proportionately equivalent to the impacts calculated for Burney Falls.

Although TMP developed a drought water budget, TMP did not use this budget for calculating project specific impacts during drought in their most recent submittal. Instead, for worst case conditions, TMP assumes that the total discharge rate for Burney Falls would be 87 028 acre-feet per year. This estimate number is based on a single measurement of flow from Burney Creek at Burney Falls in September of 1994 performed by California Department of Fish and Game (DM and LA, July 16, 2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California, Table D2) and on estimated projected water consumption in 2030.

Although using a single flow measurement as the basis for their drought conditions estimate is an obviously tenuous, there were also significant errors in the assumptions and development of the applicant’s drought water budget. However,

SOIL & WATER Table 10
Three Mountain Power Plant
Water Budget for Burney Basin, Current Conditions (2000)
Average Hydrologic Year

WATER BUDGET ITEM	Components	Subtotals	Totals
	(acre-feet per year)		
INFLOW			
Precipitation		**407,000**	
Groundwater underflow from Hat Creek		**0**	
TOTAL INFLOW			**407,000**
OUTFLOW			
Total basin ET, excluding human consumption		**238,000**	
Human Consumption			
Municipal/Domestic	800		
Industrial	1,400		
Agricultural	17,500		
Total Human Consumption		**20,000**	
Basin Discharge			
Burney Falls Surface Water	29,000		
Burney Falls Groundwater	103,000		
Salmon Springs	17,000		
Other Outflow	0		
Total Basin Discharge		**149,000**	
TOTAL OUTFLOW			**407,000**
BUDGET IMBALANCE			**0**

Dames & Moore and Lawrence & Associates, March 2000, page 2-2

Notes: ET = evapotranspiration
Budget Correction: Total Human Consumption=19,700;
budget imbalance =+300 acre-feet per year

because this drought water budget was not used in the applicant's final assessment of impacts under drought conditions, it does not warrant discussion at this time.

Based on TMP drought-year estimate, the applicant has calculated that the maximum reduction in discharge to Burney Falls caused by the project would still be less than 1 percent during a worst-case drought under both current and future water use conditions. As with the analysis of normal conditions, TMP assumes that impacts to other creeks in the region will be proportionately equivalent the impacts calculated for Burney Falls under drought conditions. Based on these analyses, the applicant has concluded that project specific impacts to Burney falls and other springs in the region would be less than significant under all foreseeable hydrologic and water use conditions.

As expressed previously, staff is particularly concerned about project impacts during drought. One key assertion in TMPP's submittals is that the 1988-1992 drought represents the worst case drought conditions for Burney basin and that the single measurement in September 1994 can be used to estimate project impacts during droughts. Further, TMPP has asserted that 5 years is the longest drought experienced in Burney during the last 100 years (DM and LA, July 16, 2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California). From a common sense standpoint, TMP's conclusion that the Burney basin did not experience the 20-year drought that occurred in the rest of Northern California from the late 1910's to the late 1930's is implausible.

From a technical standpoint, TMP's analysis, illustrated by TMPP Figure D1, contains fundamental errors (DM and LA, July 16, 2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California). First of all, plotted data lacks a common reference point for comparison of the precipitation records shown. The second problem is that each value in the data set is averaged over a different time period. This means that data that represents a wetter than average period of time will have a higher relative reference point than data that is averaged for over a longer and more varied period of time. Finally, each gap in the precipitation record is filled in with an interpolated value based on the previous and following precipitation record. This approach skews the data because there is no correlation between the sequence of hydrologic conditions from year to year.

If these data were replotted with each set of data normalized over the same set of years and without the cumulative approach, the resulting plot would show a good correspondence in precipitation between the stations and would indicate that Burney most certainly experienced the drought that spanned the late 1910's to the late 1930's in Northern California. Therefore, it would be an error to assume that the 1988-1992 drought represented the worst case drought conditions that could occur in Burney basin.

Finally, Staff notes that there were also significant errors in the assumptions and development of TMP’s drought water budget. Although the approach used by staff resulted in the same conclusion as that reached by TMP about the project’s direct impacts, the differences in methodology is important when evaluating the project’s potential to create significant cumulative impacts on biological resources. As a result, Staff strongly recommends that the Committee reject TMP’s analysis.

WASTEWATER

The wastewater treatment and discharge methods for the project have been changed significantly several times since the project was first proposed in the original AFC (TMPP 1999a). Each redesign of the project has been reevaluated by

CEC staff for impacts, mitigation, and compliance with LORS. The project as currently designed will have no wastewater discharge.

Various process and waste streams will be produced in the plant, and are shown in Soil & Water Resources Table 11 for operating scenarios with and without recycled water available (TMPP 2000a). Water entering the TMP plant will first be treated using a multimedia filter to remove any suspended solids. A reverse (RO) osmosis system then reduces hardness, silica and TDS, and this water is used for CTG evaporative cooling and as feed to the demineralizer. The demineralizer produces low TDS (2 umhos/cm) water and involves two 150 gpm cation-anion trains, caustic and acid storage, demineralized water storage, and neutralization tank for regeneration wastes. A 150,000-gallon demineralized storage tank will provide approximately 21 hours of storage during the hottest months. Alternatives to demineralization are being considered that may eliminate regeneration chemicals and neutralized wastes, but have not been described.

Cooling tower make-up water will be a major use of groundwater supplied by BWD. Should recycled water become available, it may also be used for cooling tower make-up. Cooling tower blowdown will be directed to a sidestream softener to reduce hardness and silica that will allow the circulating water in the cooling tower to be achieve 20-cycles of concentration.

The circulating water system will have a chemical feed system to minimize corrosion and control mineral scale and biofouling. Sulfuric acid will be fed into the circulating water system to reduce alkalinity and control scaling. A scaling inhibitor consisting primarily of organic phosphates will be fed into the circulating water system to further control scale formation. Biofouling will be controlled using a 12.5 percent sodium hypochlorite bleach solution. The auxiliary cooling water system is treated in the same manner as the circulating water.

The original facility design (TMPP 1999a) was estimated to require approximately 2900 acre-feet of water annually, while discharging approximately 440 acre-feet of wastewater discharged to percolation ponds. These volumes were later revised upward, with the project then requiring a 3500 acre-feet annual water supply, with a 760 acre-feet annual wastewater discharge to percolation ponds (White & Case/Cottle 1999l). During February of 2000 the project was redesigned and the original percolation ponds were replaced with evaporation ponds. In August of 2000 the project was again redesigned when the evaporation ponds were eliminated and replaced with a crystallizer, at which point the project longer had a wastewater discharge (TMPP 2000a) and also no longer required WDRs from the CVRWQCB.

The wastewater treatment system consists of a side stream softener, a reverse osmosis system, a brine concentrator (evaporator) and a crystallizer. The side stream softener allows circulating water to cycle 20 times in the cooling towers and the RO system allows the cooling tower blowdown to be further concentrated. The RO product water is recycled back to the cooling towers and the RO reject brine stream is sent to the brine concentrator and crystallizer systems. The composition of the softener solids is shown in Soil & Water Resources Table 12; these solids are disposed of off-site.

Soil & Water Table 11
PROCESS AND WASTE STREAMS

Stream No.	Stream Description	Summer Flow gpm @ 98°F	Summer Flow gpm @ 98°F	Average Flow gpm @ 48°F
		Well Water Only	Well Water and Recycled Water	
1	Well Water	2728	2542	169
2	RO Effluent	111	111	26
3	Mixed Bed Feed	26	25	26
4	Mixed Bed Product	22	22	22
5	Total Demin. Water Usage	22	22	22
6	CTG Demin. Wash Water Usage	1	1	1
7	CTG Evap. Cooler Water Usage	85	85	0
8	HRSG Makeup Demin. Water	21	21	21
9	Cooling Tower Makeup	2550	2550	112
10	Utility Washdown Water	1	1	1
11	Oily Water Sep. Effluent	3	3	3
12	HRSG Blowdown Streams	27	27	27
13	Cooling Tower Blowdown	532	532	23
14	Mixed Bed Reject	4	4	4
15	RO Reject	50	50	13
16	Neutralization Tank Waste Potable	54	54	17
17	Water Usage	15	15	15
18	Clean Rain Water Retention	-	-	-
19	RO Inlet	158	158	37
20	Firewater System Usage	0	0	0
21	C.T. Evaporation	2657	2657	163
22	C.T. Drift & Loss	1	1	1
23	Softner Return To CT	404	404	17
24	Evap Cooler Waste	20	20	0
25	Multimedia Filter Inlet	160	160	39
26	MM Filter Backwash	2	2	2
27	Service Water Supply	2728	2542	169
28	Purified Water Return To CT	184	184	26
29	Misc System Leaks And Drains	1	1	1
30	Continuous Blowdown	22	22	22
31	Continuous Blowdown Flash Stream	2	2	2
32	Continuous Blowdown Drain	20	20	20
33	Intermittent Blowdown	0	0	0
34	Blowdown Tank Vent	5	5	5
35	Service Water To Blowdown Tank	12	12	12
36	Misc Chem Feed	5	5	5
37	Service Water	13	13	13
38	Water Lost In SSS	0	0	0
39	BC Distillate	74	74	18
40	BC Waste To Crystallizer	14	14	3
41	SSS Outlet	127	127	6
42	RO Inlet	184	184	26
43	RO Distillate	96	96	4
44	BC Inlet	88	88	22
45	Crystallizer Return	14	14	3
46	Recycled Water	0	186	0

1. Firewater pump testing is 30 min./wk with returning to the tank. Annual usage is based on 5.5 hr/yr at 1500 gpm.
2. Summer flow based on 98°F ambient temperature and 18.6% relative humidity. Average flow based on 48°F ambient temperature and 68.4% relative humidity.

Soil & Water Resources Table 12
SOFTENER SOLIDS COMPOSITION[1]

Softener Solids	Pounds/hour
$CaCO_3$	187.6
$Mg(OH)_2$	91.6
SiO_2	11.7
Phosphate scale inhibitor	9.3
Copolymer	3.2
Phosphate – HRSG scale inhibitor	2.6
Polymer – HRSG dispersant	2.6
Total Dry	308.6
Filter Cake – Solids %	50%
Total	617

[1] Ambient flow temperature is 98°F

The brine concentrator source feed is heated to near boiling in a heat exchanger and then enters the evaporator, which is a vertical tube, falling film, vapor compression unit. In the crystallizer the concentrated brine is heated and flashes in the vapor body with the water vapor being collected, condensed and recycled for reuse in the plant. As the brine becomes supersaturated with salts, these salts precipitate from the solution as crystals, which are continuously removed from the system by filtration. The crystalline solids removed by the filters will be disposed of off-site. The chemical composition of these solids is shown in Soil & Water Resources Table 13.

Soil & Water Resources Table 13
CRYSTALLIZER SOLIDS COMPOSITION[1]

Crystallizer Solids	Pounds/hour
KCl	3.5
KNO_3	0.9
$ZnCl_2$	0.2
NaCl	9.7
Na_2SO_4	287.1
$CaSO_4$	10.0
$MgSO_4$	0.5
$CuSO_4$	0.0
$SrSO_4$	0.2
$BaSO_4$	0.0
$Na_2B_4O_7$	0.4
DEHA – HRSG scale inhibitor	0.3
RO scale inhibitor	0.7
Total Dry	313.6
Filter Cake – Solids %	75%
Total	418

[1] Ambient flow temperature is 98°F

TMP has provided analyses that indicate that the constituents contained in these solids would not be present at concentrations exceeding either the Total Threshold Limit Concentration (TTLC) or the Soluble Threshold Limit Concentration (STLC) values (TMPP 2000a). These TTLC and STLC values are used to determine if a solid waste would be considered a hazardous waste under the Resource Recovery and Conservation Act (RCRA). It does not appear at this time that these solids would be classified as RCRA or California hazardous waste, nor would they require disposal as a California designated waste (Class I or II) which would require disposal in a California Class III waste facility. These data also indicate that the use of recycled water, should it be provided by the BWD at some point in the future, would probably not alter the classification of this solid waste (TMPP 2000a).

Currently, the BWD stores sludge in a sludge lagoon when it is periodically removed from the percolation ponds. Sludge is removed from the lagoon and disposed of in a landfill approximately every ten years. Should recycled water be used, additional solids will be removed as sludge by the BWD as the recycled water is produced from the current BWD POTW wastewater that is currently treated to a secondary standard. BWD will have to install new treatment equipment to provide the recycled water, which includes new clarifier, flow equalizer, filtration, coagulant and chlorination systems. The additional solids removed from the secondary POTW effluent to produce the required quality and amount of recycled water will result in the BWD sludge lagoon requiring cleaning every nine years rather than every ten years.

The recycling facility design is still in the preliminary design phase and may change from it's currently proposed configuration when the design is finalized (personal communication with Bill Suppa of BWD on 11/15/00). In order to produce the recycled water for use the TMPP, the BWD will install new and/or modify existing treatment equipment to provide the reclaimed water. The principal new or modified treatment equipment will include clarifier, flow equalizer, filtration, coagulant and chlorination systems. The new tertiary clarifier will use alum and polycationic coagulants. The new filtration unit will be of the travelling bridge type, and will use coal and sand filter media. The filter cleaning backwash will either be returned to the treatment headworks, or discharged to the percolation ponds. A chlorination contact tank will use chlorine gas to provide disinfection for the tertiary recycled water, and will have a volume of 5,620 cubic feet. The new recycled improvements will occupy approximately one quarter acre of the existing 8 to 9 acre BWD facility. A pipeline with a length of approximately 1000 feet will carry the recycled water to the TMPP facility.

The quality of the water supplied to the project was estimated based on water sampled from the existing BMP well, and is shown in Soil & Water Table 14 with additional groundwater quality data provided in TMPs Detailed Mitigation Plan (TMPP 2000a). Ground water quality within the Burney does vary (White & Case/Cottle 1999f), with the wells at Johnson Park having somewhat poorer water quality than either BWD or BMP wells. Since the proposed wells have not been constructed, projected water quality data from other wells in the area must be considered as an estimate.

Soil & Water Table 14
TMPP ESTIMATED WASTEWATER QUALITY [1,2]

Waste Stream	Cooling Tower	HRSG Blowdown	Multimedia Filter Reject	RO Reject	Oily Water Separator	Total Plant Wastewater
Flow (gallons per minute)	444	25	2	11	4	466
Cations, mg/L as ion						
Calcium	61	6	12	40	3	59
Magnesium	35	3	7	23	2	34
Sodium	42	4	8	27	2	44
Potassium	10	1	2	8	1	10
Iron (ferrous)	0	0	0	0	0	0
Aluminum	0	0	0	0	0	0
Copper (cupric)	0	0	0	0	0	0
Zinc	0	0	0	0	0	0
Manganese	0	0	0	0	0	0
Ammonia	1	0	0	0	0	1
Sum of Cations	150	14	29	99	7	149
Anions, mg/L as ion						
Bicarbonate	427	40	84	278	21	415
Carbonate	0	0	0	0	0	0
Hydrate	0	0	0	0	0	0
Chloride	20	2	4	16	1	19
Fluoride	0	0	0	0	0	0
Nitrate	8	1	2	2	0	8
Phosphate	1	0	0	0	0	1
Phosphorus	0	0	0	0	0	0
Sulfate	20	2	4	13	1	25
Reactive Silica	177	17	35	114	9	172
Sum of anions	654	62	128	423	32	640
TDS, mg/L as ion	843	83	158	529	40	826

[1] Note: Based on 48°F ambient temperature and maximum duct firing
[2] Note: White & Case/Cottle 1999e

For example, the Lawrence and Associates report (1999) indicates that the BWD wells have an average TDS concentration of 76 mg/L while the Johnson Park and BMP wells have average TDS concentrations of 220 mg/L and 126 mg/L, respectively. However, since no wastewater will be discharged by the project and all constituents contained in the cooling water will be removed to appropriate disposal facilities as solids, concentration of these constituents in the cooling water will be sufficiently mitigated by the wastewater treatment and disposal systems in the redesigned project.

DRAINAGE

The drainage system is designed to contain on-site the flow expected from a 10-year storm prior to the construction of the TMP facility. A new 40’ x 40’ storm water detention basin will be constructed in the northwest corner of the TMP site just inside the access road and berm that circles the site. Storm water will be routed away from buildings or equipment and collected in shallow swales or drainage ditches and channeled from the south and east around the plant to the depression at the north west corner of the plant site. Oily water will be collected separately and piped to an oil-water separator. Oil free water is discharged to the storm water system. Oil contaminated water is periodically removed from the separator and appropriately disposed of as required (Bibb and Associates 1999).

Outflow from the basin will be controlled through the use of a restrictor plate which releases only water of a volume corresponding to a 10-year storm flow of 2.11 cubic feet per second (cfs). Flow associated with a 100-year storm in excess of 2.11 cfs will be stored in the pit at the northwest corner of the site, which is about 150 feet by 200 feet with a depth ranging from 1.3 feet to 0 feet. The access road will be graded such that it forms a detention dike with 0.5 feet of freeboard in the case of a100-year event. Discharge from the pipe will be directed to the existing railroad drainage culvert (Bibb and Associates 1999).

TMP indicated that the 2.11-cfs stormwater flow is pre-project (currently existing conditions). A less than 10-year storm may be retained and evaporated if the height of the water does not exceed the invert elevation (1 foot above the bottom of the retention pond) of the discharge pipe (Bibb and Associates 1999).

TMP’s stormwater and erosion control plan for the project site and linear facilities will provide for adequate mitigation for cumulative impacts related to soil erosion and drainage concerns. The use of a crystallizer in the redesigned project and subsequent disposal of waste as solids in a landfill will address cumulative impacts related to waste generation and waste disposal.

CUMULATIVE IMPACTS

WATER RESOURCES

Cumulative impacts result from the incremental impact of the project when added to other past, present and reasonably foreseeable conditions. Because the project will not have any impacts on erosion and sedimentation, drainage, or impacts from the use of wastewater, the only cumulative impact addressed in this section is that resulting from impacts on water supply. Project water consumption would add to the cumulative impact of human consumption of groundwater, especially during the summer months and during drought.

TMP estimates that water consumption by human activities is currently about 20,000 acre-feet per year, increasing to about 21,000 acre-feet per year by the year 2030 (DM, March 2000). Although approximate, Staff agrees with this estimate of human consumption of water. TMP's water consumption would initially be about 600 acre-feet per year, increasing to about 900 acre-feet per year when recycled water becomes available and increasing to a maximum of about 1,100 acre-feet per year if the wastewater treatment plant operated at maximum capacity. TMP's water use would increase the total human water consumption by about 3 percent to 5 percent.

Staff is particularly concerned with the TMPP's contribution to the cumulative effect of human consumption on discharges from springs during drought and during the summer months. The additional effect of the project's summer water use may add to substantial reduction in water supplies during drought, particularly to small springs.. Given the apparent high value of regional hydraulic conductivity of the aquifer, impacts caused by groundwater consumption during the summer probably transmit rapidly through the aquifer, increasing the likelihood of effecting springs during the summer months. Because most of the human consumption of water is used for crop irrigation and cooling, water use is disproportionately higher in the summer months, which is also when TMP use of water would be the highest.

The potential for cumulative impacts to Crystal Lake is of special concern, given the presence of endangered biota, according to staff biologists. Staff's examination of the groundwater data collected and analyzed by TMP (DM and LA, July 16, 2000, Appendix G - Supplemental Hydrogeologic Studies for the Proposed Three Mountain Power Plant, Burney, California) and Fox (May and June 2000) indicates that Crystal Lake is hydraulically connected the to the Burney aquifer system and may be impacted by groundwater use in Burney basin.

However, assessing the likelihood and magnitude of significant cumulative adverse impacts of human water consumption, as well as the addition of project water consumption, on small springs is difficult. Because of the lack of information on the apparent complexity of the flow paths within the aquifer, the lack of long-term information on spring flows, and the lack of information on the response of the aquifer and springs to drought conditions, staff could only provide an approximate range of potential reductions in flow to small springs, including Crystal Lake, that could be caused by human consumption and project consumption of water.. Table 15 provides an estimate of the cumulative effect of human consumption on the outflows for the springs in Burney basin.

Soil & Water Table 15
Cumulative Reduction in Outflows Caused by Human Consumption

	Human Consumption (afy)	Burney Basin Outflows WithHuman Consumption (afy)	Burney Basin Outflows Without Human Consumption (afy)	Reduction of Outflows Caused By Human Consumption (percent)
Average Conditions				
Annual	20,000	152,000	172,000	12%
Summer	18,000	35,000	53,000	34%
Drought Conditions				
Annual	20,000	76,000	96,000	21%
Summer	18,000	17,500	35,500	51%

AVERAGE OUTFLOWS

Summer outflows are based on and proportional to the flows measured at Burney Falls during the summer of 1921. Based on this analysis, staff concludes that project water use will add to substantial cumulative reduction of spring flows caused by human consumption, especially during droughts. Significant cumulative adverse impacts caused by these reductions are addressed the Biological assessment of the FSA.

TMP did not provide an analysis of TMPP's contribution to the cumulative effect of human consumption on discharges from springs

MITIGATION

APPLICANT'S MITIGATION

TMP has submitted a draft Erosion Control and Stormwater Management Plan (Bibbs 1999), which also discusses the revegetation of the TMP site post construction. The draft plan identifies both temporary and permanent erosion control measures for both construction and operation of the power plant site. Temporary construction measures are intended to control the flow of stormwater runoff across disturbed areas. Temporary drainage facilities will be sized to accommodate a 10-year, 24-hour storm (TMPP 1999a). To ensure sediment does not leave the site, silt fences, straw bales straw check dams, and storm drain inlet protection will be used. Dust control will be also implemented. The plan also proposes revegetation of certain disturbed areas. Linear facilities that include pipelines and transmission lines are included in these plans.

Water quality mitigation measures include curbs or dikes around all hazardous chemical storage facilities to control accidental discharges (TMPP 1999a). Materials/supplies transfer pads of a volume to hold a maximum spill along with containment sumps will also be used. In addition, TMP will comply with NPDES permit requirements for storm water discharges during operation. The permit will include wastewater discharge standards for constituents of concern and monitoring measures to insure compliance with these standards.

As discussed under Water Supply and Wastewater, the redesigned project as currently proposed will have no wastewater discharge. Through the use of a brine concentrator and a crystallizer all water will be recovered for reuse within the plant and all constituents contained in the supply water will be concentrated and removed as solids and disposed of at a landfill.

Late last summer, TMP proposed to redesign the project's cooling system to reduce water supply needs. The principal provisions of this amendment include (TMPP2000a):

- Parallel hybrid wet and dry cooling systems for the TMPP;
- TMPP will retrofit the BMP facility to use parallel hybrid wet and dry cooling;

- The combined use of fresh groundwater by TMPP and BMP will not exceed 950 acre-feet/year;
- TMP will use recycled water from the BWD to the extent available;
- TMP will include a crystallizer to distill and recycle water so that the project will not require the use of wastewater discharge ponds;
- TMP will submit to the CEC or otherwise make public data indicating the actual amount of fresh water from any and all sources that TMP and BMP use from all sources on at least a yearly basis;
- TMP will make a one-time lump sum contribution in the amount of $250,000 to the California State Parks to assist with providing educational programs at Burney Falls;
- Payment of the TMP contribution is contingent upon certification of the project by the CEC, and is payable on the day before the TMP commences construction.

To provide accurate information to assess of actual impacts that would be caused by project groundwater use, TMP proposes the following aquifer test and analysis. TMP has proposed to conduct (or cause BWD to conduct) aquifer tests in each of the two project wells to be constructed by the BWD to establish in situ hydraulic parameters in the Burney groundwater aquifer. These aquifer tests would be conducted either (a) within 120 days after the construction of the project wells are completed and sufficient water storage is provided to the project owner by BWD, or (b) during commissioning of the project, whichever of (a) or (b) occurs first (but in no event later than the start of commercial operation of the project).

From these in situ hydraulic parameters and the project well-log data, the project owner (or the BWD) would verify that the aquifer of groundwater from such wells as required by the project would not interfere with neighboring wells. Based on the results of the aquifer test, transmissivity of the aquifer, storativity (storage coefficient) of the aquifer, and the specific capacity would be calculated for each of the two project wells.

Prior to conducting the aquifer test, the project owner would submit a work plan detailing the methodology to be used to conduct the proposed aquifer tests and to calculate the specified parameters and values to the Energy Commission CPM for review and approval. The protocol for the aquifer tests would provide data to calculate the in situ hydraulic parameters of the Burney groundwater aquifer as follows:

- at a minimum, the aquifer tests for each of the two project wells would include the measurement of drawdown in the other non-aquifer project well that is screened at the same depth as the aquifer well,
- wells monitored for each aquifer test must be sufficiently close to the aquifer well that aquifer produces measurable drawdown of sufficient duration in the monitored wells to analyze the site-specific hydraulic parameters including transmissivity and storativity in the Burney groundwater aquifer, and

- single well aquifer tests and aquifer tests that do not produce enough measurable drawdown in monitored wells to conclusively calculate hydraulic parameters will not satisfy the Conditions of Certification.

To verify this that this testing and evaluation has occur, the project owner will submit test plans and a final report of the results to the CEC. At least 2 months prior to the start of the aquifer tests, the project owner would submit to the Energy Commission CPM the work plan that details the methodology for conducting the proposed aquifer tests on the 2 BWD wells for the project and for calculating the specified parameters and values. With the approval of the work plan by the Energy Commission CPM, the project owner would perform the aquifer tests following the approved protocol. Within 2 months after completion of the aquifer tests, the project owner would submit to the Energy Commission CPM a report detailing how the aquifer tests were conducted and the results of the tests, including the calculation of (1) the in situ hydraulic parameters of transmissivity and storativity for the Burney groundwater aquifer, and (2) the site-specific values of effective horizontal hydraulic conductivity and specific capacity for each project well.

TMP has also proposed that the project owner would pay BWD to install a groundwater level monitoring system for the two project wells and to prepare an annual report describing monthly groundwater levels taken on the same day at each of the two project wells and at the existing BWD well #7. To verify that monitoring is conducted, the owner would submit periodic reports to the CEC. Within 120 days after the end of each calendar year following the start of commercial operations of the project, the project owner would submit a copy of the annual report describing monthly groundwater levels for such calendar year to the Energy Commission CPM.

To ensure that the project does not exceed the proposed groundwater use rate, TMP has proposed the following mitigation. The only water used for project operations would be fresh groundwater obtained by the project owner from wells to be installed, operated and maintained by the BWD at the location described in the Agreement between the BWD and Three Mountain Power, LLC Concerning the Additions to and Modifications of the District Water System and the Provision of Service to the Three Mountain Power Generation Facility, dated April 19, 2000; provided, however, the project owner may also (but is not required to) use recycled water for project operations if recycled water is made available to the project owner by the BWD.

The Three Mountain Power project's use of fresh groundwater in each calendar year would be limited to (a) 600 acre feet, plus (b) an amount equal to the difference, if any, between (i) 350 acre feet per year, and (ii) such smaller number of acre feet per year of groundwater as is actually used by BMP for its own project operations during such calendar year. The foregoing limits on the Three Mountain Power project's use of fresh groundwater would not be increased or decreased by the Three Mountain Power project's potential or actual use of recycled water.

The project owner would pay BWD to install a water meter that measures the supply of groundwater by the BWD to the project. Within 120 days after the end of each calendar year, the project owner would provide to the Energy Commission CPM an annual report prepared by the BWD verifying the amount of groundwater supplied to the project during each month of such calendar year according to the BWD's meter readings.

The project owner would cause BMP to install a meter on all wells used by BMP to provide water to BMP for its own operations. Within 120 days after the end of each calendar year, the project owner would provide (or cause BMP to provide) to the Energy Commission CPM an annual report prepared by BMP and signed by an authorized officer of BMP verifying the amount of water consumed by BMP during each month of such calendar year.

STAFF MITGATION MEASURES

Staff supports TMP's proposal for aquifer testing. Staff recommends additional aquifer testing protocol and analysis of the results to ensure that project impacts are accurately assessed.

With regards to the aquifer tests, recharge should not occur when the aquifer tests are performed to avoid underestimates owing to drawdown. The aquifer tests should be performed during a dry period. Tests should not be performed if rain or snowmelt has occurred during the 7 days. Similarly, groundwater pumped during the test must be contained and not allowed to discharge on the ground. If the drawdown in the well is in excess of 10 feet, a second test should be performed to include the monitoring of the Hathaway well, with the owner's permission. This second test shall be performed at the maximum expected operation rate to exceed the calculated period of time necessary to cause measurable drawdown in the Hathaway well. Calculation of the pumping period for the second test should be based on the aquifer parameters calculated in the first test.

With regards to the recalculation of worst-case drawdown impacts the following assumptions and considerations should be made:

1. transient conditions ,
2. pumping period = life of the project,
3. variable pumping, based on estimated seasonal water use,
4. analysis of project drawdown impacts should not include groundwater recharge,
5. include the maximum water consumption from BWD water treatment plant (500 acre-feet per year), and
6. include pumping shared with BMP that is in excess of BMP's average annual water use.

Staff recommend monitoring of groundwater levels andmetering of water use.

As discussed in Water Supply, staff has proposed a Condition of Certification that any future use of recycled water would be capped at the current design capacity of the BWD POTW, which is 440,000 GPM or approximately 500 acre-feet/year of recycled water.

Total consumptive water use by TMP will be capped at 950 acre-feet/year without the use of recycled water and at 1450 acre-feet/year with the use of recycled water. These caps are based on 600 acre-feet/year of fresh groundwater dedicated to TMP use, 350 acre-feet/year of fresh groundwater shared between BMP and TMP, and up to 500 acre-feet/year of recycled water if it should become available at some future date.

FACILITY CLOSURE

Typically, closure raises concerns in regard to potential erosion. Since, however, there should be no significant cut and fill slopes vulnerable to erosion, this is not a significant concern for the project. In addition, groundwater wells to be used by the project will be closed following DWR procedures, minimizing groundwater contamination and safety issues. BWD would operate the wells, which would be closed according to DWR requirements.

COMPLIANCE WITH APPLICABLE LORS

In this section staff addresses the compliance of the proposed TMPP with applicable laws, ordinances and standards, including compliance with State Water Resources Control Board (SWRCB) Policy 75-58, entitled Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling. This policy encourages he use of alternative sources of cooling water or the use of alternative cooling technology.

SWRCB POLICY 75-58

This policy states that the source of power plant cooling water should come from the following sources in order of priority:

1. Wastewater being discharged to the ocean.
2. Ocean water.
3. Brackish water from natural sources or irrigation returns flow.
4. Inland wastewaters of low total dissolved solids.
5. Other inland waters.

Clearly, the first two sources listed are not reasonable options for the proposed project. Nor do irrigation return flows appear to represent a reliable or sufficient water source. Wastewater treatment effluent is not currently available in sufficient quantities, and although TMP has proposed this an option, TMP has not committed to producing and using recycled water to reduce the projects use of fresh inland water. Any recycled water would be derived from the BWD POTW wastewater stream that is currently treated to a secondary level. This water would need to be treated to tertiary levels and disinfected before use as cooling tower make-up.

Staff is not aware of natural sources of brackish water within the area and irrigation return flows if of sufficient volume are only seasonally available. Staff is not aware of other wastewater streams in the project vicinity that are sufficient in volume for project use. Sources of inland water within the project vicinity other than the proposed groundwater are limited to surface water flows, the diversion of which would likely have greater environmental impacts than the proposed source. Under implementation, the policy also states that "Proposals to utilize unlined evaporation ponds for final disposal of blowdown water must include alternative methods of disposal."

DRY AND WET/DRY COOLING

SWRCB Policy 75-58 also states that "…studies associated with power plants should include an analysis of the cost and water use associated with the use of alternative cooling facilities employing dry, or wet/dry modes of operation."

Since TMP is proposing to use a parallel wet/dry cooling system, the project complies with this portion of the policy. Given the lack of alternative water sources with the exception of recycled water, staff concludes the project complies with the spirit of this policy.

CONCLUSIONS AND RECOMMENDATIONS

Staff has sufficient information for the following issues to reach conclusions, make recommendations, and develop Conditions of Certification.

1. With the project redesigned to eliminate a wastewater discharge through the use of a brine concentrator (evaporator) and crystallizer, compliance with any CVRWQCB Waste Discharge Requirements (WDRs) is no longer required.
2. The project's use of up to 500 acre-feet/year of recycled water, should it be developed and available for use at some point in the future, will likely result in a net benefit to groundwater quality downgradient from the BWD percolation ponds.
3. The redesigned project using a wet/dry parallel cooling system arrangement will use less fresh groundwater than the original project design using wet cooling only. This assumes that should the project use only 600 acre-feet/year of fresh groundwater, a water savings of 2300 acre-feet/year (79 percent) would be achieved relative to the original wet cooling project design requiring 2900 acre-feet/year of fresh groundwater. If up to a maximum of 500 acre-feet/year of recycled water (derived from groundwater) were consumed in addition to the 600 acre-feet/year of fresh groundwater, a water savings of 1800 acre-feet/year (62 percent) would be achieved relative to the original project design requiring 2900 acre-feet/year of fresh groundwater.
    a. These water savings assume a maximum consumptive use of fresh groundwater by BMP of 350 acre-feet/year would occur whether or not the TMPP operates.
    b. This maximum consumptive fresh groundwater use value for BMP was claimed by TMP in the Detailed Mitigation Plan (TMPP 2000a), but no basis or substantiation was provided for what was described by TMP as this "historical" BMP groundwater use.

4. Any adverse impacts on nearby wells related to the pumping of groundwater for the project's water supply needs will not be known until the aquifer tests are performed and nearby wells are monitored for impacts. TMP has agreed to testing that will result in reasonable estimates of these impacts and to mitigation that will effectively reduce these impacts to a less than significant level.
5. The California Department of Parks and Recreation Department has entered into a Mitigation and Settlement Agreement with TMPP (DOJ 2000a) and has decided that the project will not have a significant impact to Burney Falls if all terms and conditions of the Agreement are followed.
6. TMP has submitted a stormwater management and erosion control plan for the project that includes the linear facilities associated with the TMPP, such as the construction of the gas pipelines, electrical transmission lines, the reconductoring of existing transmission lines, and water supply and domestic waste pipelines.
7. The Burney aquifer is the sole source of water for both humans and the environment. The aquifer and related springs are more vulnerable to contamination, transmission of pumping impacts, and extreme impacts from droughts than more common sand and gravel aquifers. According to staff biologists, endangered and sensitive species are regionally dependent on spring flows.
8. Analysis of the projects effects has been difficult for all parties because, although there is agreement regarding the general nature and parameters of the water resources and the aquifer of Burney basin, there are significant limitations to the available data. Importantly, there is still uncertainty regarding the flow paths within the aquifer and the response of the aquifer and springs to drought, which are needed to predict and quantify with certainty the behavior of the groundwater system and springs in response to the proposed project.

This difficulty has been compounded by TMP's use of poorly supported and inconsistent analyses, as well as by fundamental errors in TMP's submittals. Although TMP's joint mitigation plan with CURE did produce significant improvements to the project proposal, TMP has failed to correct previous errors in its analyses and new errors are contained in the revised mitigation plan.

Nevertheless, staff has concluded that the project can be conditioned to avoid unmitigated significant adverse impacts with regards to water supply. Staff recommends the adoption of the Conditions of Certification (COCs) to ensure the implementation of the project as described and compliance with LORS, mitigation agreements and monitoring plans.

CONDITIONS OF CERTIFICATION

The following conditions have been developed for the project:

SOILS & WATER 1: Prior to beginning any site mobilization, the project owner shall obtain Energy Commission staff approval for a Storm Water Pollution Prevention Plan (SWPPP) as required under the General Storm Water Construction Activity Permit for the project.

Verification: Thirty days prior to the start of any site mobilization, the project owner will submit a copy of the Storm Water Pollution Prevention Plan (SWPPP) to the Energy Commission Compliance Project Manager (CPM) for review and approval. Approval of the plan by the CPM must be received prior to the initiation of any site mobilization activities.

SOILS & WATER 2: Prior to beginning any site mobilization activities, the project owner shall obtain staff approval for a final erosion control and revegetation plan that addresses all project elements. The final plan to be submitted for staff's approval shall contain all the elements of the draft plan with changes made to address any staff comments and the final design of the project.

Verification: The erosion control and revegetation plan shall be submitted to the CPM no later than thirty days prior to start of any site mobilization. Approval of the final plan by the CPM must be received prior to the initiation of any site mobilization activities.

SOILS & WATER 3: Prior to commercial operation, the project owner, as required under the General Industrial Activity Storm Water Permit, will develop and implement a Storm Water Pollution Prevention Plan (SWPPP). Approval for the final Industrial Activities SWPPP must be obtained from Energy Commission staff prior to commercial operation of the power plant.

Verification: Thirty days prior to the start of commercial operation, the project owner will submit to the CPM a copy of the Storm Water Pollution Prevention Plan (SWPPP) prepared under requirements of the General Industrial Activity Storm Water Permit. The final plan shall contain all the elements of the draft plan with changes made to address staff comments and the final design of the project.

SOILS AND WATER 4: The only fresh water the project will use will be fresh groundwater obtained by the project owner from wells to be installed, operated, and maintained by the Burney Water District. The location of these wells will be as described in the Agreement between the Burney Water District and Three Mountain Power, LLC Concerning the Additions to and Modifications of the District Water System and the Provision of Service to the Three Mountain Power Generation Facility, dated April 19, 2000.

The Three Mountain Power project's use of fresh groundwater in each calendar year will be limited to 600 acre feet, plus an amount equal to the difference, if any, between 350 acre feet per year and the amount actually used by Burney Mountain Power (BMP) for its own project operations during each calendar year. Prior to the projects use of any portion of BMP's 350 acre-feet/year of fresh groundwater, Burney Mountain Power will be retrofitted to use a hybrid parallel wet/dry cooling system that will allow Burney Mountain Power to reduce its use of fresh groundwater.

Verification: The project owner will submit a groundwater use summary report to the CPM, the BWD and the CDPR on an annual basis beginning within 90-days after the anniversary date of the start of operation and continuing for the life of the project. The annual summary will be based on groundwater use recorded by BWD on BWD-installed and maintained water meter(s), and will include the monthly range, monthly average, and total groundwater use by the project in both gallons-per-minute and acre-feet. For subsequent years the annual summary will also include the yearly range and yearly average, and the monthly range and monthly average, e.g., the range and average for all months of June, for groundwater used by the project. The same information will be provided to the same parties for groundwater used by the BMP facility. Any significant changes in the water supply needs for the project during construction or operation of the plant will be noticed in writing to the CPM at least 120 days prior to the effective date of the proposed change.

At least 30 days prior to the projects use of any portion of BMPs 350 acre-feet/year of fresh groundwater, the projects owner will submit to the CPM a copy of a written certificate signed by an authorized officer of Burney Mountain Power confirming that the wet/dry hybrid cooling system described above has been installed and is operational. The project may not use any of BMPs 350 acre-feet/year of fresh groundwater until the BMP wet/dry hybrid cooling system is operational.

SOILS AND WATER 5: The project (TMPP) has reached agreement with the California Department of Parks and Recreation (DOJ 2000a), an intervenor in CECs licensing process. The project owners will comply with all of the following:

1. Install and operate a parallel hybrid wet and dry cooling system for the TMPP.
2. Retrofit the BMP facility to use parallel hybrid wet and dry cooling.
3. Limit the combined use of fresh groundwater by TMP and BMP to not more than 950 acre-feet/year.
4. May use recycled water from the BWD to the extent available (see Soil and Water 7 below).
5. Install and operate a crystallizer to distill and recycle water so that the project will not require the use of wastewater discharge ponds.
6. Submit to the Commission data indicating the actual amount of fresh water from any and all sources that TMP and BMP uses on at least a yearly basis.

Verification: The project will install the wet/dry parallel cooling system described in the Detailed Mitigation Plan (TMPP 2000a). Compliance will be demonstrated to the CEC CPM through a letter signed by an authorized officer of the project owner at least 60 days prior to the start of TMP operation. A summary of annual water consumed by the project will be provided in the Annual Compliance Report.

SOILS AND WATER 6: The project owner will make a one-time lump-sum contribution in the amount of $250,000 to California Department of Parks and Recreation, which will assist CDPR in providing educational programs at Burney Falls. Specifically, this payment will be used to fund a portion of State Parks' development and construction of an interpretive center to be located in Burney Falls State Park. This amount will be due and payable one (1) day before the commencement of construction of the Three Mountain Power project. This payment will be made by delivering a check made payable to the California Department of Parks and Recreation to the following:

Nicholas Stern
Office of the Attorney General
1300 I Street
P. O. Box 944255
Sacramento, CA 94244-2550

Verification: Within (1) day prior to construction the project owner will notify the CPM that the contribution described above has been delivered to the California Department of Parks and Recreation as required above. Within (10) days the project owner will provide to the CEC CPM a written certificate signed by an authorized officer of the project owner that verifies that the contribution has been made according to the conditions specified above.

SOILS AND WATER 7: The project may use up to 500 acre-feet/year of recycled water, should it be developed and available for use at some point in the future. This amount corresponds to the current design capacity of the BWD POTW of 440,000 gallons per day (approximately 500 acre-feet). At this time, recycled water use by the project is only proposed as an option, and is not currently associated with the project. The Burney Water District will be responsible for complying with all LORS and obtaining all permits required to provide recycled water to the project.

Verification: The project owner will notify the CEC CPM at least 90 days prior to the use of recycled water by the project. Project owner and will provide the CPM with copies of any permits required for the BWD to produce and distribute recycled water, i.e., CVRWQCB and/or CDHS, etc., and with copies of any permits required by the project to accept and use recycled water at least 60 days prior to use of recycled water by the project.

The project owner will submit a recycled water use summary report to the CEC CPM, the BWD and the CDPR on an annual basis beginning within 90-days after the anniversary date of the start of recycled water use and continuing for the life of the project. The annual summary will be based on recycled water use recorded by BWD on BWD-installed and maintained water meter(s), and will include the monthly range, monthly average, and yearly total recycled water use by the project in both gallons-per-minute and in acre-feet. For subsequent years, the annual summary will also include the yearly range and yearly average and the monthly range and monthly average, e.g., the range and average for all months of June, for recycled water used by the project.

SOIL & WATER 8: The project owner shall conduct (or cause Burney Water District to conduct) aquifer tests in each of the two new project well to determine the site-specific aquifer parameters. From these aquifer parameters and the project well-log data, the project owner shall evaluate if the pumping of groundwater from such wells as required by the project interferes with neighboring wells. These aquifer tests shall be conducted either (a) within one hundred and twenty (120) days after the construction of the project wells is completed and sufficient water storage is provided to the project owner by Burney Water District, or (b) during commissioning of the project, whichever of (a) or (b) occurs first (but in no event later than the start of commercial operation of the project). Two (2) small-diameter monitoring wells shall be constructed at right angles to the project wells to evaluate the anisotropy of the aquifer. For example, one well would be located north or south of the project wells, and one well would be locate east or west of the project wells. The project owner shall calculate the following site-specific values:

- transmissivity of the aquifer,
- hydraulic conductivity,
- anisotropy
- storativity (storage coefficient) of the aquifer,
- specific capacity of each of the two project wells.

Prior to conducting the aquifer test, the project owner shall submit a work plan detailing the methodology to be used to conduct the proposed aquifer tests and to calculate the specified parameters and values to the Energy Commission CPM for review and approval.

Protocol: The aquifer tests shall provide data to calculate the site-specific aquifer parameters of the Burney groundwater aquifer as follows:

- at a minimum, the aquifer tests for each of the two project wells shall include the measurement of drawdown in the other non-pumping project well that is screened at the same depth as the pumping well, and the two monitoring wells,
- test period shall be long enough to produce measurable drawdown in the observation wells of sufficient duration in the monitored wells to analyze the site-specific aquifer parameters including transmissivity and storativity in the Burney aquifer, and
- aquifer tests that do not produce enough measurable drawdown in monitored wells to conclusively calculate aquifer parameters will not satisfy the Conditions of Certification.
- Tests shall not be performed if rain or snowmelt has occurred during the previous 7 days.

- Groundwater pumped during the test must be contained and not allowed to discharge on the ground.
- If the drawdown in the well is in excess of 10 feet, a second test should be performed to include the monitoring of the Hathaway well, with the owner's permission.
- This second test shall be performed at the maximum expected operation rate to exceed the calculated period of time necessary to cause measurable drawdown in the Hathaway well. Calculation of the pumping period for the second test should be based on the aquifer parameters calculated in the first test.

Verification: At least two (2) months prior to the start of the aquifer tests, the project owner shall submit to the Energy Commission CPM the work plan that details the methodology for conducting the proposed aquifer tests on the two (2) Burney Water District wells for the project and for calculating the specified parameters and values. With the approval of the work plan by the Energy Commission CPM, the project owner shall perform the aquifer tests following the approved protocol.

Within one (1) month after completion of the aquifer tests, the project owner shall submit to the Energy Commission CPM a report detailing how the aquifer tests were conducted and the results of the tests, including the well log, the raw data, the actual test procedure, and the calculation of the aquifer parameters of transmissivity, effective horizontal hydraulic conductivity, anisotropy, storativity and specific capacity for each project well.

SOIL & WATER 9: The project owner shall recalculate the well interference impacts for existing wells within a 2-mile radius of the project. The analysis shall use the new aquifer parameter values developed from the aquifer testing of the new project wells and shall evaluate drawdown impacts for the following 2 conditions:

1. the anticipated average monthly project pumping rate for a 40-year period, and
2. the anticipated maximum project pumping rate for a 4-month period.

These two analyses shall incorporate the following assumptions and conditions.

- transient conditions ,
- pumping period = life of the project,
- variable pumping, based on estimated seasonal water use,
- analysis of project drawdown impacts should not include groundwater recharge,
- include the maximum water consumption from BWD water treatment plant (500 acre-feet per year),include pumping shared with BMP that is in excess of BMP's average annual water use.

<u>Verification:</u> The project owner shall submit a report to the CEC CPM 30 days prior to the startup of project operations that describes the calculation of well interference. The description shall include a listing of all the parameters used, the calculation method and the location and distance of impacted wells relative to the project wells.

SOIL & WATER 10: The project owner shall reimburse impacted well owners for increased energy costs associated with the increase in pumping lift, the cost of well-bowl lowering, and well deepening. The project owner shall notify all residential, commercial, municipal and agricultural landowners within a 2-mile radius of the TMP site. The project owner shall compensate all groundwater users if (1) their water supply well is located within a 2-mile radius of the proposed project site and (2) the results of the TMP aquifer tests and the site-specific well interference analysis indicate that their well water levels will decline by 5 feet or more.

<u>Verification:</u> The details of verification of payment for well interference impacts need to be developed in consultation with the applicant and other interested parties prior to certification to ensure all impacts are fully mitigated.

SOIL & WATER 11: The project owner shall measure groundwater levels in the on-site monitoring well on a monthly basis for the first six months following the project start up and thereafter on a quarterly basis.

<u>Verification:</u> Sixty days following the completion of the first six monthly groundwater level measurements, the project owner shall submit a report of the groundwater level monitoring to the CPM. Thereafter, the project owner shall submit on an annual basis the results of the quarterly groundwater level measurements.

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Davisson, M.L. and Rose, T.P., Isotope Sciences Division, Lawrence Livermore National Laboratory (Davisson) 1997, Comparative Isotope Hydrology Study of Groundwater Sources and Transport in Three Cascade Volcanoes of Northern California: dated September 1997.

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Rose, T.P., Davisson, M.L. and Criss, R.E., Department of Geology, University of California, Davis, Isotope Sciences Division, Lawrence Livermore National

Laboratory (Rose, et. al.) 1995, Isotope hydrology of voluminous cold springs in fractured rock from an active volcanic region, northeastern California: Journal of Hydrology, June 1995.

Rose, T.P., Analytical and Nuclear Chemistry Division, Lawrence Livermore National Laboratory (Rose) 2000a, The Origin of Groundwater Discharge at Burney Falls, Shasta Co., California, February 2000.

Rose, T.P., Analytical and Nuclear Chemistry Division, Lawrence Livermore National Laboratory (Rose) 2000b. Comment on isotope-mass balance models for determining the origin of Burney Falls Groundwater Discharge, memo to L.D.Bond & Associates, dated May 23, 2000, received by CEC May 26, 2000.

White & Case (White & Case/Cottle) 1999m first Supplemental Responses of three Mountain Power to CURE Data Requests 1-75; letter dated November 10, 1999. Submitted to California Energy commission on November 12, 1999.

Lawrence and Associates, ( ) 1999?, Ground-Wter Resource Evaluation of the Burney Basin and Effects of Groudnwat-Water Pumpoing and Wastewater Disposal from the Proposed Three Mountain Power Plant, Burney, Shasta County, California. Dated April 19, 1999, Submitted to California Energy commission on November 12, 1999.

Driscoll, F.G. (Driscoll) 1986 Groundwater and Wells. St. Paul, Minnesota: Johnson Division.

PREPARED DIRECT TESTIMONY OF DR. TIMOTHY ROSE

Question: Please state your name, place of employment, position, and qualifications.

Answer: My name is Dr. Timothy Rose. I work at Lawrence Livermore National Laboratory as a Chemist in the Analytical and Nuclear Chemistry Division. A copy of my CV is attached to this testimony.

Question: Other than this testimony, are you sponsoring any documents or studies today?

Answer: Yes, I am sponsoring the following documents:

(1) *The Origin of Groundwater Discharge at Burney Falls, Shasta Co., California*, dated February 2000 (Lawrence Livermore National Laboratory Report UCRL-ID-137488). This report uses light stable isotope data to develop a model for the origin of groundwater at Burney Falls. From the available evidence, it was concluded that the Burney Falls spring water was likely a mixture of groundwater from both the Burney Basin and northern Hat Creek Basin.
(2) *Comment on Isotope-Mass Balance Models for Determining the Origin of Burney Falls Groundwater Discharge,* dated May 23, 2000. This memo to L.D. Bond and Associates outlines my comments on a report prepared by Dames and Moore as part of the Three Mountain AFC proceeding, dated March 15, 2000. The May 23, 2000 memo developed an isotope mass-balance model to test the Dames and Moore hypothesis that all of the discharge at Burney Falls may originate within Burney Basin. The results of the isotope mass-balance model suggested that the Dames and Moore model was not supported by the available data.
(3) Rose, T.P., Davisson, M.L., and Criss, R.E. (1996) *Isotope hydrology of voluminous cold springs in fractured rock from an active volcanic region, northeastern California*. Journal of Hydrology, v. 179, p. 207-236. This "older" peer-reviewed journal article contains information relevant to interpreting the hydrology of fracture-flow aquifers in the Hat Creek Basin-Burney Basin region.

Question: Are you familiar with the Three Mountain Power Project and its proposal to use groundwater for evaporative cooling, including the amendments filed in the *Detailed Mitigation Plan and Analysis of Impact Assessment in Resources Areas Affected by the Mitigation Plan*, dated August 21, 2000 and docketed on August 21, 2000.

Answer: I am generally familiar with the project and its plan to use groundwater. I have not seen a copy of the *Detailed Mitigation Plan and Analysis of Impact Assessment in Resources Areas Affected by the Mitigation Plan*, dated August 21, 2000.

Question: Are you familiar with the following technical reports filed by the applicant in support of its project: *Dr. Phyllis Fox Draft Report on Joint Intervenor Study of the Burney Basin Hydrolog*y, dated October 5, 2000, docketed on Oct 17; and *Technical Memo prepared by Andrew J. Campbell, RG, CHG, Senior Hydrologist of URS entitled Character of Recent Isotope Data Collected by CURE, dated 8-16-00*, dated August 25, 2000, docketed Aug 28, 2000.

Answer: Yes

Question: Are your reports identified above relevant to those technical reports filed by the applicant?

Answer: Yes

Question: What is the relevance?

Answer: The studies identified above discuss information about groundwater flow patterns in the Burney Basin. Stable isotope data is valuable for understanding the origin and flow path of groundwater, provided the data are examined in the context of regional scale variations. The information outlined in my reports provides a framework for interpreting light stable isotope data in Burney Basin. The report by Phyllis Fox presents *new* stable isotope data for more than 60 samples collected in the specific region of interest. These new data provide considerably greater detail for understanding groundwater flow patterns in the Burney Basin. My interpretation of the combined stable isotope data (from my reports and the Fox report) differs from the conclusions drawn by the Applicant using the same data. In my opinion, the conclusions contained in the Applicant's reports are not strongly supported by these data.

Question: What have you concluded from these studies?

Answer: The isotope data suggest that *some* of the groundwater discharge at Burney Falls originates from the Hat Creek Basin. I was surprised to learn (from the Fox report) that the Burney Falls springs exhibit significant spatial variations in isotopic composition along the face of the falls. However, this observation is perhaps the most compelling evidence for a Hat Creek groundwater component. The westernmost springs at Burney Falls are isotopically similar to groundwater from wells upgradient of the springs, near the town of Burney. This water likely originated from within Burney Basin. In contrast, the easternmost springs at Burney Falls are isotopically distinct from *all* other groundwater samples in the Burney Basin, but are readily derived from Hat Creek Basin groundwater that has mixed with local recharge. There is presently *no evidence* that the easternmost springs at Burney Falls originated *within* the Burney Basin via an independent flowpath from high elevation recharge areas (which is the only possible scenario for deriving this groundwater from inside the Burney Basin). Just east of the Burney Basin, groundwater with the necessary isotopic composition is widely available. Hence, the most consistent interpretation of the data is that the groundwater emerging from springs at Burney Falls represents contributions from two independent source areas. The fact that the groundwater is not particularly well mixed by the time it arrives at the discharge area underscores the likelihood of independent origins and flowpaths.

I am not favorably impressed by the Applicant's attempts to explain away these data (e.g., URS Technical Memorandum dated August 16, 2000; "*Characterization of recent isotope data collected by CURE for the Burney Basin*"). For example, it is suggested that analytical uncertainty in the isotope measurements is sufficiently large to where the mixing models can be dismissed. However, the easternmost spring at Burney Falls has been sampled and analyzed three different times between 1994 and 2000, and the results were *identical each time* (to within ± 0.1 permil). The uncertainty in these repeated analyses is far less than required to demonstrate the proposed mixing model. In the same memo, there is an attempt to dismiss over one third of the oxygen-hydrogen isotope data pairs due to "unexplained differences" compared to the global meteoric water line. In fact, there are very simple physiochemical explanations for the observed variations in these data.

Question: Is your conclusion relevant to the Energy Commission's consideration of the application for the Three Mountain Power Project?

Answer: Yes, because it has implications about the complexity of the structure and flow paths of the aquifer system and what the effect of the project's proposed groundwater pumping will have on spring flows from the aquifers in the region. It is therefore relevant to a determination about what kinds of inferences can and cannot be drawn about the effect of groundwater use for the proposed project.

Question: Is your conclusion consistent with that reached in the technical reports filed by the applicant?

Answer: No

Question: Can you explain why it is not?

Answer: The Applicant has argued that all of the water at Burney Falls likely originates from within the Burney Basin. In my opinion, the available data simply don't support this conclusion (for the reasons outlined above).

Question: What conclusions do you believe can be reached, based on the available information about the flow of water into and out of the Burney Basin?

Answer: I would conclude that flow *into* the Burney Basin from the Hat Creek Basin is likely in the vicinity of Burney Falls. The extent to which groundwater flows into Burney Basin in the vicinity of the proposed project water-supply wells is speculative at this time. However, it is notable that a well located less than 1 mile from the proposed water-supply wells (well w32 in the Fox report) exhibits an oxygen isotopic value that may *suggest* (but does not prove) a component of Hat Creek Basin groundwater.

In general, it is important to remember that this system is hydrologically complex, and that it is difficult to make *unequivocal* statements regarding groundwater flow patterns and long-term predictions of water availability, even with relatively detailed data sets. Much of this uncertainty is linked to the fact that the flow occurs principally along fractures in crystalline bedrock. Fracture flow systems are difficult to treat using conventional hydrologic models because the flow is often localized along specific pathways. Although transmissivities are generally high in fracture-flow aquifers (i.e. large volumes of groundwater are readily transmitted through the rock) the impact of prolonged periods of drought is often dramatic (e.g., spring discharge rates can substantially decrease over the course of several drought years; see the Rose et al. (1996) paper in Journal of Hydrology for further discussion.

Question: Of what relevance is this conclusion to the Commission's consideration of the impacts of the Three Mountain Power Project and its proposed use of water?

Answer: Given that the water budgets are quite large for this region (relative to the amount of water expected to be used by the Applicant), it would appear that sufficient water will be available for the project under ordinary circumstances. My greatest concern is with regard to possible deleterious impacts during a prolonged drought period. A satisfactory answer to this concern probably is not possible at this time. Hence, if the Three Mountain Project were to be approved, it would be prudent to require a long term water-level monitoring program (coupled with monitoring of spring discharge at Burney Falls) so that accurate worst-case scenario models could be developed. These models could be used to help determine reasonable limits for water usage under severe drought conditions.

Question: Does that conclude your testimony?

Answer: Yes

WITNESS QUALIFICATIONS

TIMOTHY PATRICK ROSE

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Education

Ph.D., Geochemistry, University of California, Davis, 1994.
M.S., Geology, Michigan State University, 1988.
B.S., Geology (Geophysics option), Michigan State University, 1986.

Professional History

Project Manager, Lawrence Livermore National Laboratory (10/00 – present)

- Responsible for contract management of the Underground Test Area project, a $1.5M/year work-for-others program funded by the U.S. Department of Energy, Nevada Operations Office.
- Coordinator of research efforts to investigate the fate and mobility of radionuclides associated with expended underground nuclear test cavities at the Nevada Test Site.

Research Chemist, Lawrence Livermore National Laboratory (01/97 – 10/00)

- Program development leader for geochemistry and isotope hydrology investigations at the Nevada Test Site.
- Technical representative of isotope tracer and transport capabilities to external funding agencies and major programs at Lawrence Livermore National Laboratory (LLNL).
- Improved fate and transport predictions of radionuclides beneath the Nevada Test Site by linking regional groundwater flow paths to environmental isotopic measurements.
- Demonstrated link between low deuterium excess values in arid-region spring waters and isotope enrichment processes occurring during snowpack metamorphism.
- Co-developed a new technique for the *in situ* measurement of radionuclides sorbed to mineral surfaces using the ion microprobe.
- Committee member on 2 MS thesis projects (U.C.Davis, U.Oregon)

Post-Doctoral Research Associate, Lawrence Livermore National Laboratory (01/95 – 01/97)

- Co-investigator in Isotope Hydrology research program at LLNL
- Co-discovered magmatic CO_2 occurrences in large volume springs and developed a new approach for calculating CO_2 flux from active volcanic systems.
- Co-developed a new approach for the slow growth of secondary carbonate minerals under equilibrium isotopic conditions in the laboratory.
- Co-developed a new isotope ratio mass spectrometer facility at LLNL

Research and Teaching Assistant, University of California, Davis (09/87 – 12/94)

- Performed isotope hydrology research to determine the origin of large volume springs in northeastern California
- Applied isotopic mapping techniques to delineate fossil hydrothermal circulation patterns at shallow levels within an eroded stratovolcano.
- Assisted in developing a new stable isotope laboratory; constructed vacuum extraction lines;

trained and supervised laboratory assistants.

- Taught lab courses in physical geology, petrology, mineralogy.

External Publications

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Davisson, M.L., Smith, D.K., Kenneally, J. and Rose, T.P. (1999) Isotope hydrology of southern Nevadagroundwater: stable isotopes and radiocarbon. Water Resour. Res., 35: 279-294.

Benson, L.V., Lund, S.P., Burdett, J.W., Kashgarian, M., Rose, T.P., Smoot, J.P. and Schwartz, M. (1998) Correlation of Late-Pleistocene lake-level oscillations in Mono Lake, California, with North Atlantic climate events. Quaternary Res, 49: 1-10.

Rose, T.P. and Davisson, M.L. (1996) Radiocarbon in hydrologic systems containing dissolved magmatic carbon dioxide. Science, 273: 1367-1370.

Rose, T.P., Davisson, M.L. and Criss, R.E. (1996) Isotope hydrology of voluminous cold springs in fractured rock from an active volcanic region, northeastern California. J. Hydrol., 179: 207-236.

Timothy P. Rose

Rose, T.P., Criss, R.E., Mughannam, A.J. and Clynne, M.A. (1994) Oxygen isotope evidence for hydrothermal alteration within a Quaternary stratovolcano, Lassen Volcanic National Park, California. J. Geophys. Res., 99: 21,621-21,633.

Rose, T.P., Criss, R.E. and Rossman, G.R. (1994) Irradiative coloration of quartz and feldspars withapplication to preparing high-purity mineral separates. Chem. Geol., 114: 185-189.

Hofmeister, A.M., Rose, T.P., Hoering, T.C. and Kushiro, I. (1992) Infrared spectroscopy of natural, synthetic and 18O-substituted -tridymite: structural implications. J. Phys. Chem., 96: 10,213-10,218.

Mills, J.G., Jr. and *Rose, T.P.* (1991) Manganoan fayalite [$(Fe,Mn)_2SiO_4$]: A new occurrence in rhyolitic ash-flow tuff, southwestern Nevada, U.S.A. *Am. Mineral.,* 76: 288-292.

RICHARD A. SAPUDAR
Environmental Specialist III

EXPERIENCE SUMMARY

Experienced in the water resources, water quality, wastewater discharge and soil resources technical areas. Have obtained education, training and experience in environmental transport, fate and toxicology of chemicals in the environment, water quality, water resources and the regulation and management of waste discharges.

EXPERIENCE RECORD

1999 – Present: California Energy Commission, Environmental Protection Office. Reviews and analyzes data and prepares oral and written testimony on water and soil resource impacts of power plant siting projects, including water resources, water quality, and wastewater discharges. Evaluates the adequacy of project siting documents, significant impacts, and impact mitigation. Determines compliance of power plant applications with existing laws, ordinances, regulations, and standards and prepares environmental documentation as required by the California Environmental Quality Act (CEQA). Coordinates with other federal, State and local agencies as required.

1995 – 1999: California Department of Water Resources, Water Quality Assessment. Designed, coordinated, and conducted studies and field investigations related to the State Water Project watersheds, source waters, reservoirs and associated project facilities. Performed environmental and drinking water quality monitoring studies related to Delta channel dredging and levee maintenance and source water quality for the State Water Project. Produced reports and gave committee and conference presentations reporting findings.

1985 – 1995: California State Water Resources Control Board, Division of Water Quality. Developed aquatic sediment assessment methods and sediment quality objectives for the bays and estuaries of the State that considered both environmental chemistry and toxicological testing endpoints. Designed, coordinated and conducted monitoring studies in ground and surface waters, sediment, and biota. Developed ambient water quality objectives to regulate waste discharges to ocean waters in accordance with the California Ocean Water Quality Control Plan and the Federal Clean Water Act

1983 – 1985: Chevron Corporation, Chevron Environmental Health Center. Acted as lead person for the central emergency information and environmental incident contact team and assessed the degree of human or environmental exposure, in the event of human, terrestrial, or aquatic contamination incidents. Performed background research in support of product registration and litigation resulting from human or environmental contamination involving company products.

EDUCATION

B.S. in Environmental Toxicology from the University of California at Davis, 1982

PROFESSIONAL AFFILIATION

Society of Environmental Toxicology and Chemistry, Northern California Regional Chapter

Linda D. Bond, R.G.

PRINCIPAL HYDROGEOLOGIST

SUMMARY: Seventeen years of experience in hydrogeologic investigations with expertise in numerical modeling, analysis of regional groundwater systems, and evaluation of the impacts of drought, conjunctive use, water transfers and urban growth.

EDUCATION *Master of Science, Applied Hydrogeology*, 1986, Stanford University, Palo Alto, California

Bachelor of Arts in Geology,1983, San Francisco State University, San Francisco, CA
(Summa Cum Laude and hood recipient for the School of Science)

Bachelor of Arts in Education & Political Science, 1974, Antioch College, Yellow Springs,
Ohio

Chapter 2 CAREER SUMMARY

1998 to present - Principal Hydrogeologist, LDBond & Associates, Davis, CA

1989 to 1998 - Principal Hydrogeologist, Hydrologic Consultants, Inc, Sacramento, CA

1986 to 1989 - Hydrogeologist, Montgomery-Watson, Walnut Creek, CA

1983 to 1986 – Hydrologist (GS-7), U.S. Geological Survey, Water Resources Division, Menlo Park, CA

1981 to 1983 – Exploration Geologist, Sohio Petroleum, Alaska Exploration Division, San Francisco, CA

REGISTRATION AND ASSOCIATIONS

Registered Geologist, (R.G. No. 4656), California
Groundwater Resources Association
Association of Ground-Water Scientists & Engineers
Bay-Delta Modeling Forum

RELEVANT EXPERIENCE

- Expert witness to the California Energy Commission since 1998 on water resources for power plant siting cases, including High Desert Power Project (Victorville, CA), Three Mountain Power Plant Project (Burney, CA), Blythe Energy Project (Blythe, CA), and Mountainview Power Plant (San Bernardino County, CA). Work includes detailed technical analysis, groundwater modeling, public workshop participation, written testimony, and Commission Committee hearing testimony.

- Expert witness to the U.S. Bureau of Reclamation (2000). Evaluated finite element modeling of deterioration process in the water supply Siphons within the Central Arizona Project system.

- Hydrogeologic consultant to the Butte Basin Water Users Association since 1992. Developed a comprehensive evaluation of regional water resources of Butte Basin (Sacramento Valley, California). Work based on the development of a three-dimensional groundwater model that includes a synthesis of 26 years of hydrologic and geologic data, characterization of water use and crop consumption, and detailed representation of agricultural and urban water service districts. The model has been used to analyze hydrologic impacts of drought, 1994 water transfers, potential surface-water allocation cutbacks, water and land-use conversion, urban growth, and other regional groundwater management issues.

RELEVANT EXPERIENCE (continued)

- Project manager for Putah Creek Landowners Association (Yolo and Solano counties, CA) in water-rights adjudication proceedings. Developed and presented technical evaluation of stream hydrology involving historical diversions from Putah Creek, operation of Monticello Dam, and changes in stream recharge to groundwater system. The work successfully supported the groundwater rights of the Association.

- Provided regional analysis of the groundwater storage potential of proposed restoration of the Feather River Watershed for the Butte Basin Water Users Association. (Project Manager)

- Project manager for the evaluation of the potential for land subsidence owing to drought-bank water transfers from Yolo County, California. Developed groundwater model to quantify magnitude for potential impacts. Work performed for the Yolo County Flood control & Water Conservation district.

- Project manager (1989-1994) for the development of a three-dimensional numerical groundwater flow model for Turlock and Modesto Irrigation Districts. Initially, this model was developed to support negotiations and license renewal for New Don Pedro Reservoir by the Federal Energy Regulatory Commission (FERC). Additional applications of the model under my project management included:
    - Development of a quantitative analysis that was used to successfully defend Turlock Irrigation District in a challenge to the District's right to augment surface-water deliveries with groundwater during the 1989 drought. Demonstrated the District's right to groundwater through its contribution to long-term regional groundwater recharge from surface-water irrigation.

  - Evaluation of groundwater impact of the potential use of surface water by rapidly growing municipalities in the Turlock area.
  - Evaluation of salinity of groundwater from wells in the Turlock area caused by the upwelling of saline water from marine formations underlying the fresh-water aquifer system.

- Developed water-use parameters and calibration for a groundwater-flow model of the Santa Ynez Valley for the city of Lompoc. The model provides a technical basis for negotiations with the U.S. Bureau of Reclamation and other parities concerning the reoperation of the Cachuma Reservoir. The model analyzes the interaction between the Santa Ynez River and the regional groundwater system and accounts for the effects of groundwater pumping, reservoir operations, streambed leakage, and consumptive use by agricultural, phreatophyte vegetative and municipalities.

- Provided a technical analysis of the pumping drawdown for partially penetrating wells in the Butte Basin aquifer for the development of the 1994 Well Spacing Ordinance for Butte County. (Project Manager)

- Developed groundwater flow and transport models to assess contamination at numerous industrial, municipal and federal sites. Applied models to identify sources and migration paths of contaminant plumes, to direct field investigations, and to evaluate alternatives for aquifer remediation.

- Developed solute-transport groundwater model of Pajaro Valley, California to evaluated the problem of regional seawater intrusion. Identified the pathways, the mechanisms, and the rate of movement of seawater intrusion into Valley's primary aquifer. (Master's Thesis)

PARTIAL LIST OF PUBLICATIONS AND PRESENTATIONS

Durbin, T.D., *Bond, L.D.*, FEMFLOW3D: a Finite-Element Program for the Simulation of Three-Dimensional Aquifers: U.S. Geological Survey, Open File Report 97-810.

Bond, L.D., 1998, Butte Basin Water Users Association Groundwater Model - the Groundwater Hydrology of Sacramento Valley, Northern California Water Awareness Workshop: Public presentation sponsored by the Butte Basin Water Users Association, Chico, CA, March 26.

Bond, L.D., 1997, Chico General Plan Study, Groundwater Resources Analysis: Public presentation prepared for the City of Chico, CA, February 27.

Bond, L.D., 1994, Impacts to the Butte Basin Groundwater from the 1994 State Water Bank: Public presentation for the Butte Basin Water Users Association, Durham, CA, October 26.

Bond, L.D. and Bredehoeft, J.D., 1987, Origins of Seawater Contamination in a Coastal Aquifer - A Case Study of the Pajaro Valley, California: Journal of Hydrology, v. 92, p. 263-388.

Ozbilgin, M.M., *Bond, L.D.*, Gleason, P.J., and Kavanaugh, M.C. 1988, Application of solute transport modeling for evaluation of remediation alternatives and setting of ground-water clean-up levels: Proceedings of Superfund 1988, Washington, D.C.

Bond, L.D., 1986, U.S. Geologic Survey Pajaro Ground-Water Transport Model for Pajaro Valley, Presentation made to Pajaro Valley Water Management Agency, Watsonville, California.

REFERENCES:

Mr. Joe O'Hagan, Contract Manager, California Energy Commission
516 Ninth Street
Sacramento, CA 95814-5512
(916) 653-1651

Mr. Robert MacKenzie, County Counsel, Butte County
25 County Center Drive
Oroville, CA 95965
(530) 538-7621

Mr. Jim Keith, Project Manager, U.S. Bureau of Reclamation
P.O. Box 25007
Mailstop D8140
Denver, CO 80225
(303) 445-3121

Mr. Tim Durbin, Principal Hydrologist, Former President of Hydrologic Consultants, Inc.
4509 Woodfair Way
Carmichael, CA 95608
(916) 966-8637

RESUME OF

LINDA K. SPIEGEL
BIOLOGIST

PROFESSIONAL EXPERIENCE

Biologist Planner II/Researcher — ***California Energy Commission***
2/85 - Present — ***1516 Ninth St, Sacramento, CA***

Energy Facility Siting - Environmental Assessments: Planner I/Planner II. 1988 - Present.

Provide technical analyses of proposed energy-related projects on biological resources. Duties include the analysis of impacts, identification of mitigation measures and compliance monitoring programs, providing written and oral testimony, and coordinating with other agencies. Knowledge of applicable laws, and species taxonomy and life history.

San Joaquin Kit Fox Monitoring Study: Principal Researcher/Office Manager. 1989-1993.

Design, coordinate, and supervise study to determine effects of oil development on the endangered kit fox, evaluate effectiveness of standard survey techniques, and develop effective mitigation measures. Study involved radio telemetry, capture-recapture, scat analysis, and standardized survey techniques to research home range, diet, relative abundance, survival rates, den characteristics, habitat use, reproduction, dispersal, and toxicology. Responsibilities include office and contract management, data collection and analysis, coordination with other agencies and researchers, and presentation of data through publishable and technical reports and professional and informal forums.

Southern San Joaquin Valley Ecosystems Protection Program: Project coordinator/Researcher/ Planner I. 1986-1989.

Coordinated all aspects of a study to identify and inventory available natural lands in Southern San Joaquin Valley and to prioritize those lands on the basis of natural quality into biologically defensible preserves. The project's goal was to develop a strategy to protect habitats important to the recovery of five listed animal and five plant species endemic to the area. Duties included administration, supervision, training, field surveys, small mammal trapping, data management, report writing, formal presentations, and inter-agency coordination. Organized and co-chaired the "Endangered and Sensitive Species of the San Joaquin Valley: A Conference on Their Biology, Management, and Conservation" held in December 1987.

Cache Creek and Lake Berryessa Bald Eagle Study: Wildlife Biologist/Crew Supervisor. 1985-1986.

Conducted a two-year study to evaluate potential impacts to bald eagle wintering sites from a proposed transmission line. The study involved trapping and radio tagging bald eagles to determine flight patterns, foraging and roosting sites, food habits, and responses to local land use practices including recreation, ranching, and water management. Responsibilities included study design and implementation, data collection and analysis, and report writing.

Wildlife Biologist/Consultant — ***Self-employed***
1983-1985 — ***Chico, CA***

Contracted to perform biological impact analyses for a variety of proposed development projects in California from Fresno County north to Alameda County. Responsibilities included writing proposals, survey design and implementation, crew supervision, mitigation design, agency coordination, species life history research, report writing, and knowledge of plant, animal, and habitat taxonomy and endangered species laws.

Environmental Studies Specialist/Biologist — ***Nevada Department of Transportation, Carson City, NV***
7/84 - 1/85

Determined the affects of proposed highway or other transportation-related projects on vegetation, wildlife, and wetland resources. Developed mitigation measures to minimize impacts to these resources and to protect sensitive and/or listed species. Responsibilities included maintaining communications with other management agencies, conducting field surveys with data collection, evaluation, and analysis, literature research, and technical report writing.

Wildlife Biologist
1981 - 1984

Bureau of Land Management - Alturas Resource Area, CA: Contracted to investigate the habtitat needs of nesting bald eagles and develop Habitat Management Plans for the protection of bald eagle territories in northern California.

University of California, Berkeley: Analyzed the ecological structure of roosting and foraging habitat for the California spotted owl in the Eldorado National Forest. Responsibilities included radio tracking, botnay transects, and owl surveys.

BioSystems Analysis, Inc.: Assisted in the study of bald eagles along the Pit River in northern California. Responsibilities included capturing and radio tagging eagles, telemetry tracking, and monitoring eagle foraging behaviors.

California Department of Fish and Game: Field work: San Joaquin kit fox studies, black-tailed deer studies, sandhill crane studies, and vegetation transects. Laboratory and data analysis: bobcat sex-age structure and spotted owl distribution

EDUCATION
B.A. Biology & Chemistry Science 1982 California State University, Chico

PERMITS HELD
Raptor Trapping, Banding, and Collecting Blood
USFWS: #20431Z CDFG: #5200

San Joaquin Kit Fox Trapping, Radio-collaring, and Collecting Blood
USFWS: SPIELK-4 CDFG: MOU

Small Mammal Trapping
USFWS/CDFG: #5200

AFFLIATIONS

The Wildlife Society
President, Western Section 1999
Member of the Western Section Executive Board since 1992

PUBLICATIONS AND REPORTS

List available upon request.

GARY D. WALKER
Environmental Planner

EXPERIENCE SUMMARY

Experienced in analysis of socioeconomic, land use, transportation, visual, cultural and paleontological resource issues relating to electrical energy projects. Educational background in history, archaeology, and environmental policy.

EXPERIENCE RECORD

1985-to present

California Energy Commission, Energy Facility Siting and Environmental Protection Division, Environmental Protection Office. Energy Facility Siting Planner. Evaluate proposed electrical energy projects for potential socioeconomic, land use, transportation, visual, and cultural resource issues. Participate in workshops with applicants and the public. Prepare written testimony. Present testimony at hearings and respond to cross-examination.

1980-1985

California Energy Commission, Energy Facility Siting and Environmental Protection Division, Environmental Protection Office. Project Manager. Coordinated staff evaluation of electrical energy projects. Developed case strategy. Was staff lead contact with applicants, government agencies, and the public. Organized workshops, compiled and edited staff reports, and presented testimony.

EDUCATION

B.A. in History, 1969, University of California, Santa Barbara

M.A. in History, 1971, University of California, Santa Barbara

Graduate Program, Environmental History, 1971-76, University of California, Santa Barbara

M.A. in Anthropology, 1993, University of California, Davis